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Portable Woodworking Machines by Mass Production

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The value of a machine depends upon its suitability for its work, the character of its design and the accuracy with which its parts are machined and assembled

LET me preface this article by the statement that the machines we manufacture are intended to be taken to the work they are to do, rather than to bring the work to them. Therefore, the most appropriate mechanical components are incorporated in their design and the highest standards of accuracy are maintained in their production.

The fabrication of machinery is accomplished by one of two methods, namely: building or manufacturing. Let us analyze these methods and compare their relative merits. According to Webster, "build" means to construct like a house. Applying this method to making machinery we find that the engineer designs the machines, making drawings of the individual parts and placing dimensions indicating the surfaces to be machined for the guidance of the machinist. General - purpose machine tools are used, and special tools, jigs, and fixtures, are not required, as the work is performed by skilled machinists. It is a well-known fact that by this method it is impracticable to machine a number of the same parts accurately enough to make them interchangeable. It is not the intention, however, to write disparagingly of the term "build," as it is a fundamentally correct method in some cases and should be treated as such.

Now let us analyze the manufacturing method. We again consult Webster for the definition of "manufacture" and find this: "The conversion of raw material into articles for use." Let us see how this is accomplished. The engineer designs the machines, making drawings for the individual parts, placing dimensions expressed in whole numbers and decimals indicating the surfaces to be machined. In addition to these dimensions an allowable tolerance is ascertained as to a maximum and minimum size to which the machined surfaces must be held. Special machines, or general - purpose machines, equipped with special tools, jigs and fixtures are used, and it is not necessary to em-

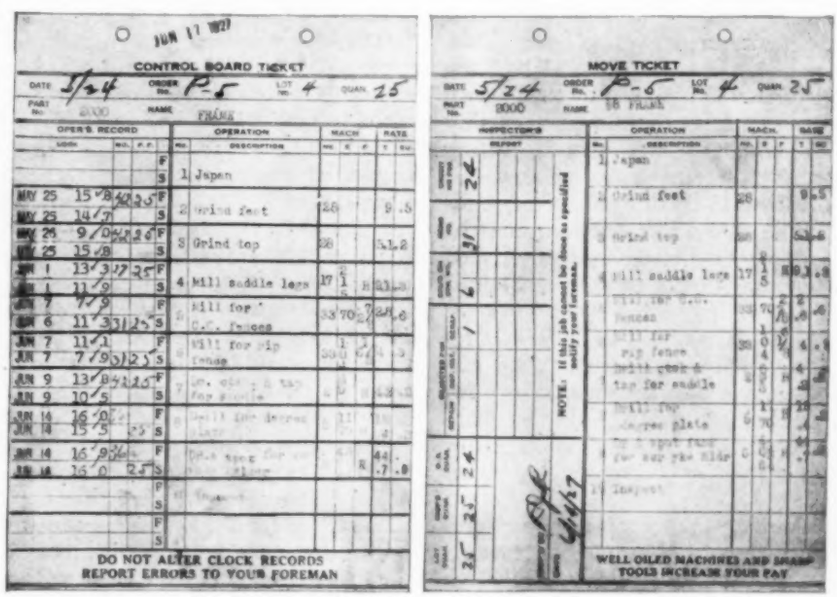

CONTROL BOARD TICKET
DO NOT ALTER CLOCK RECORDS
REPORT ERRORS TO YOUR FOREMAN
MOVE TICKET
WELL OILED MACHINES AND SHARP
TOOLS INCREASE YOUR PAY

Fig. 1 — Control-board and move tickets. The control-board ticket tells how, when and where the work is to be done. The move ticket is similar, except that the inspector's report replaces the operator's record

The first part of the article. The conclusion will appear in an early issue.

Fig. 2—The control board. It consists of a rack arranged to hold the control-board tickets and is divided vertically into two sets of four spaces, and horizontally into as many spaces as there are work stations. The top row of spaces is stenciled with the names of the work stations. The other rows, respectively, hold tickets for jobs in process, jobs next, and jobs not ready to be begun. Fig. 3—Grinding tops and bottoms of frames. The feet are ground to an accurate plane so that the casting will rest equally on all four corners. The holding fixture is held by a magnetic chuck. The frame casting is larger than the wheel and must be ground in two settings

ploy highly skilled machinists to operate the machines so equipped. It requires but a comparatively short time to teach a new man to manipulate a machine after it has been set up to perform a certain operation and, in a sense, it becomes an automatic machine for accurately duplicating each successive part. It is obvious that parts so machined are interchangeable.

A few comparisons of the two methods will be to the point. By the building method the equipment cost is lower than with the manufacturing method. This, however, is offset by the high cost of skilled labor, the necessarily low rate of production obtained by the general purpose machines, and the sacrifice of interchangeability of parts. It is true that under the manufacturing method, equipment cost is a serious factor. However, when we take into consideration the lower cost of semi- or unskilled labor, the high rate of production, and the interchangeability of parts obtained from specially-tooled machines, the *unit cost* is much lower than that obtained by the building method.

The universal market, which has been developed in recent years, for portable woodworking machinery has enabled our company to install adequate machinery for production by the manufacturing method, and the quantities produced by this equipment make possible a low unit-cost that cannot be approached with any other method.

The mechanism for planning and controlling our production consists of a stores record, a requisition form, a control board ticket, a move ticket, and a control or despatch board. The stores record is equipped with a signalling system that presents a graphic picture of the status of production, thus furnishing the necessary information as to when and what parts need to be worked to replenish the stores and maintain a balanced inventory. The control-board ticket, Fig. 1, furnishes information as to how, where and when the work should be done. The move ticket is similar, except that in place of the operator's record, this space is ruled for the inspector's report on which he notes his findings. This information serves the timekeeper for crediting the operators with the quantity of good work finished.

The control board, shown in Fig. 2, is a rack suitably arranged to hold the control-board tickets. It is divided vertically into two sets of four spaces each, and horizontally into as many spaces as there are "work stations." The topmost row of spaces is stenciled with the names of the work stations; the next row holds the control-board tickets for "jobs in process"; the third row holds the tickets for "jobs next"; and the fourth and last row holds the tickets for "jobs ahead" but not quite ready for work to be started.

Each workman is assigned to one or more work stations. When he finishes the job in hand he does not go to the foreman, but goes directly to the control board and takes the tickets that hang in the spaces "jobs in process" and "jobs next"; records the time finished on the first ticket and stamps the starting time on the second ticket by a time-recording clock located beside the control board. (See Fig. 2.) He then deposits the finished-job ticket on a receptacle, hangs the job ticket for the new job in the space for jobs in process under his work station, then goes about his work. This system relieves the foremen of all the worries of finding work for their men and permits them to concentrate on seeing that the work is up to the standard of quality and schedule.

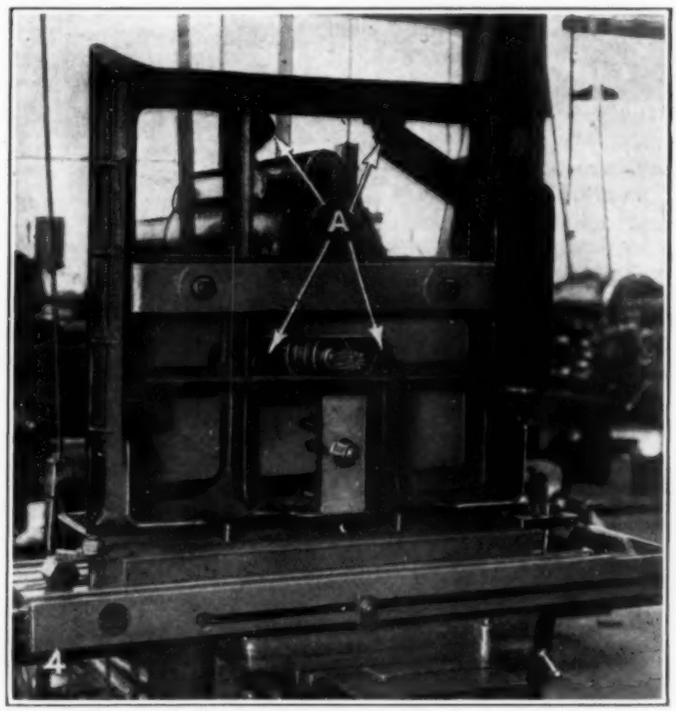
We pay our workers an hourly wage established in the ordinary way at the time of hiring. To provide an incentive for high production, we also pay a premium over the hourly rate. By an accurate time study, a reasonable production rate is set for each of the 5,000 and odd operations on the 1,000 or more parts made for the machines. The worker is paid his hourly wage for all production up to the rate or "task" set. If his production is double the specified rate, his pay is doubled, etc. By this method our workers produce the maximum possible number of accurate parts and earn an average of 35 per cent more than their hourly rate of pay.

We manufacture various types of portable woodworking machinery, but for the purpose of illustrating our methods, this article will be confined to details of our No. 8 universal saw. Since our machines are of the portable type, the selection of materials is an important factor. This is especially true of the castings, as light weight, strength and rigidity are prerequisite in portable machines. It is not economical for the moderate-sized manufacturing concern to operate a foundry, so a supplier of castings was selected for skill in producing castings for portable machines, such as sewing machines, typewriters, etc., thus insuring us of the uniform high-grade material and workmanship required. When received, the castings are stored in an open shed adjacent to the main factory building, from which they are taken to the cleaning, japanning and enameling departments.

The smaller castings to be japanned are thoroughly cleaned from rust and sand with a steel scratch-brush, placed in a tank of cleaning solution at a boiling temperature, then taken out and allowed to dry before dipping in a tank of black baking-japan. From the japanning tank the castings are placed on dripping racks having a suitable pan underneath to return the surplus japan to the tank. When all dripping has ceased, the castings are placed in an oven and baked at 300 deg. F. for 3 hr. This method not only produces a beautiful finish, but also the most durable and serviceable finish known.

The larger castings are cleaned by the same method as the small ones, the application of the enamel, however, differs in the following respect: the finishing medium is a high-grade air-drying black enamel, the degree of sheen or luster matching the black baking-japan on the smaller castings. The castings remain in the cleaning tank until they attain a temperature of approximately 212 deg. F. Upon removal they become dry in a few seconds and the enamel is then applied by dipping while the castings are still very hot. The cooling literally shrinks on the enamel, making it a part of the casting, thus eliminating the possibility of scaling or peeling that often occurs when enamels are applied to cold surfaces. The quality of finish and durability approaches very closely a japanned job.

The castings are now ready for the machine work. We will follow the frame of the machine through the various operations in the order in which they are performed. It should be noted that special jigs, fixtures and tools are employed for each operation to insure duplication of subsequent lots. Fig. 3 shows the operation of grinding the top and bottom of the frame. A magnetic chuck is mounted on the table of a 14-in. surface grinder and holds the grinding fixture in position. The feet are ground to an accurate plane so that the casting will rest equally on all four corners. The frame casting is 25-in. square, and since the capacity of the grinder is limited to 14 in., one-half of the surface only can be ground at a time, and it is necessary to make two settings in order to grind the complete surface. To facilitate handling, the roller turntable, shown at *A*, is mounted at the rear of the grinder table at the height



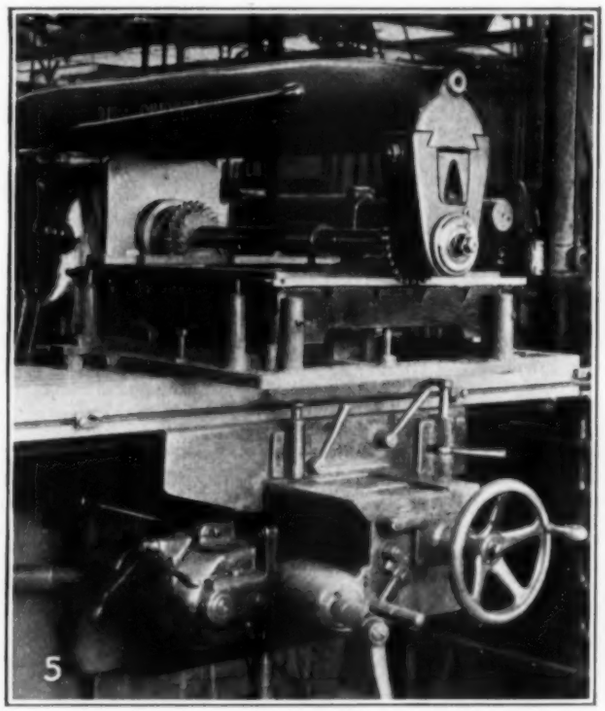
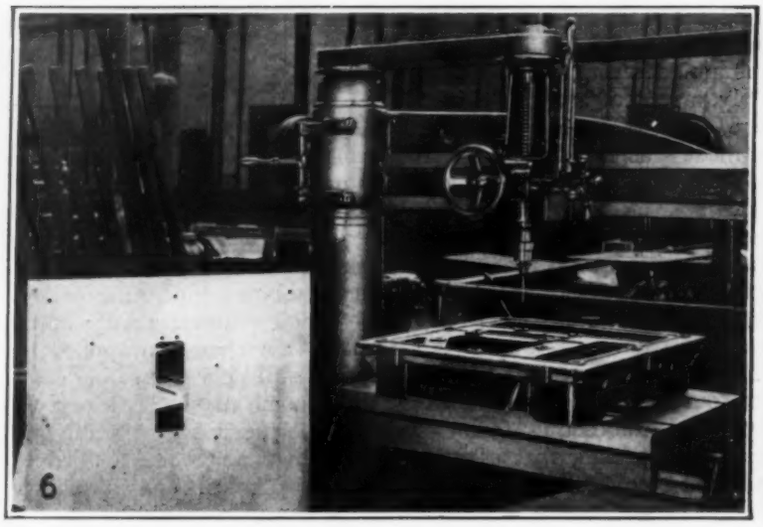


Fig. 4—Milling the saddle lugs. Four lugs are positioned in pairs at each end of the frame and 1½ in. below the surface, presenting some difficulty in machining. The work must be done with great accuracy, because the saw-tilting mechanism is attached to these lugs. Fig. 5—Milling the fence rails for the cross- and rip cuts. There are three fence rails, all of which are integral with the frame. The milling is done in two settings in which separate gangs of cutters are used. The rails on the tops and two sides are each milled in one operation



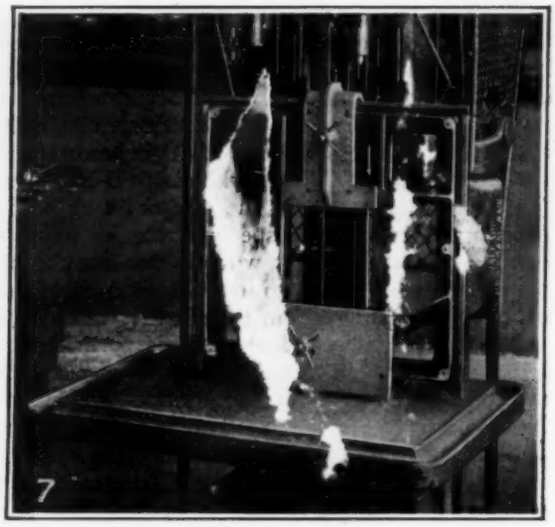


Fig. 6—Drilling and tapping holes for the table and the saddle. The same jig is used for drilling both the frame and the table, resulting in accurate matching of the holes. Since the table top is very thin, any misalignment of holes in it and the frame would cause buckling. Fig. 7—Drilling for degree-angle and name plate. In this operation, four No. 50 holes are drilled in the frame. The drilling must be accurately done, otherwise the angle plate, which is etched in degrees, would not indicate the true angle between the saw and the table

of the magnetic chuck. The fixture loaded with the frame, is moved onto the turntable and revolved one-half turn then relocated on the magnetic chuck for completing the grinding. It should be noted that the frame is not disturbed in its holding fixture before completion of grinding. This fixture illustrates a very efficient method of accurately producing comparatively large work on a small machine. The saw-tilting mechanism for making angular cuts is bolted to the top surfaces of the saddle lugs. This of necessity requires great accuracy so as to maintain the proper position of the saw blade with respect to the fence rails. The four lugs *A*, Fig. 4, are positioned in pairs at each end of the frame 1½ in. below the top surface, thus presenting some difficulty in machining. Ordinarily this operation would be performed on a drill press with a spot facing tool. The milling machine, however, affords a much greater degree of accuracy. Therefore, a special fixture is used, locating the frame from the top surface and the lugs are milled with an end mill.

Expenditure for Special Tools Limited by Quantity of Production

The fence rails are three in number, cast integral on three sides of the frame. Quantity of production limits the allowable expenditure for special tools, and in this case the number of parts produced does not warrant the expense of a costly indexing fixture, so we perform this operation in two settings with one comparatively simple fixture. Two special-cutter set-ups, mounted on individual arbors for each of the two operations, are maintained for this job only. Cutters are removed from their respective arbors only when grinding becomes necessary. The rails are milled on the tops and two sides in one operation. As the two crosscut fence-rails, located on opposite sides of the frame, are milled simultaneously, as shown in Fig. 5, accurate alignment of the two slides with reference to each other is accomplished. The same fixture is used for milling the rip fence-rail on the end of the frame, which is relocated and registered from one of the previously-milled surfaces of the crosscut fence-rails. Departing slightly from the subject in hand, the simple and superior construction of the frame and fence rails, or slides, is noteworthy, as this construction eliminates the attendant complications of alignment mechanisms necessary where the ways are separate parts.

Drilling and tapping table- and saddle-screw holes is performed on a radial drill. There are twenty holes drilled in the frame, twelve of which are for holding down the steel table-top. The drill jig is designed for drilling the screw holes in the table top as well as in the frame. The table top shown in Fig. 6 is a thin steel plate 25 in. square, specially flattened and finished to a beautiful silver gray, and the limits of flatness are very exacting. Any misalignment of the corresponding screw holes in the frame and table top (which is comparatively thin) would cause buckling of the plate when fastened to the frame and would produce a very uneven surface. The two-fold purpose of this drill jig has solved this problem admirably.

Drilling for Accurate Location of Gage for Making Angular Cuts

In the next operation, Fig. 7, four No. 50 holes are drilled and tapped for fastening the degree-angle and name plate to the frame. This plate has etched upon its face a scale graduated through an arc of 45 deg. for the purpose of indicating accurately the angle of the saw blade with reference to the table when making angular cuts. To facilitate handling, the drill jig is made in two parts, an angle plate serving as a base and holding fixture, and a comparatively light jig, or templet, located by two of the saddle-lug holes (see Fig. 4) and the top surface of the frame, thus locating accurately the position for the degree-angle plate with reference to the axis of rotation of the saw-tilting mechanism.

This operation completes the machine work done on the frame. From the foregoing description of our machining methods it can be seen that the scheme of interchangeability has been carried out to a high degree. A few parts taken at random will be used to further illustrate the manufacturing methods of our woodworking machinery.

(To be concluded in the next issue.)

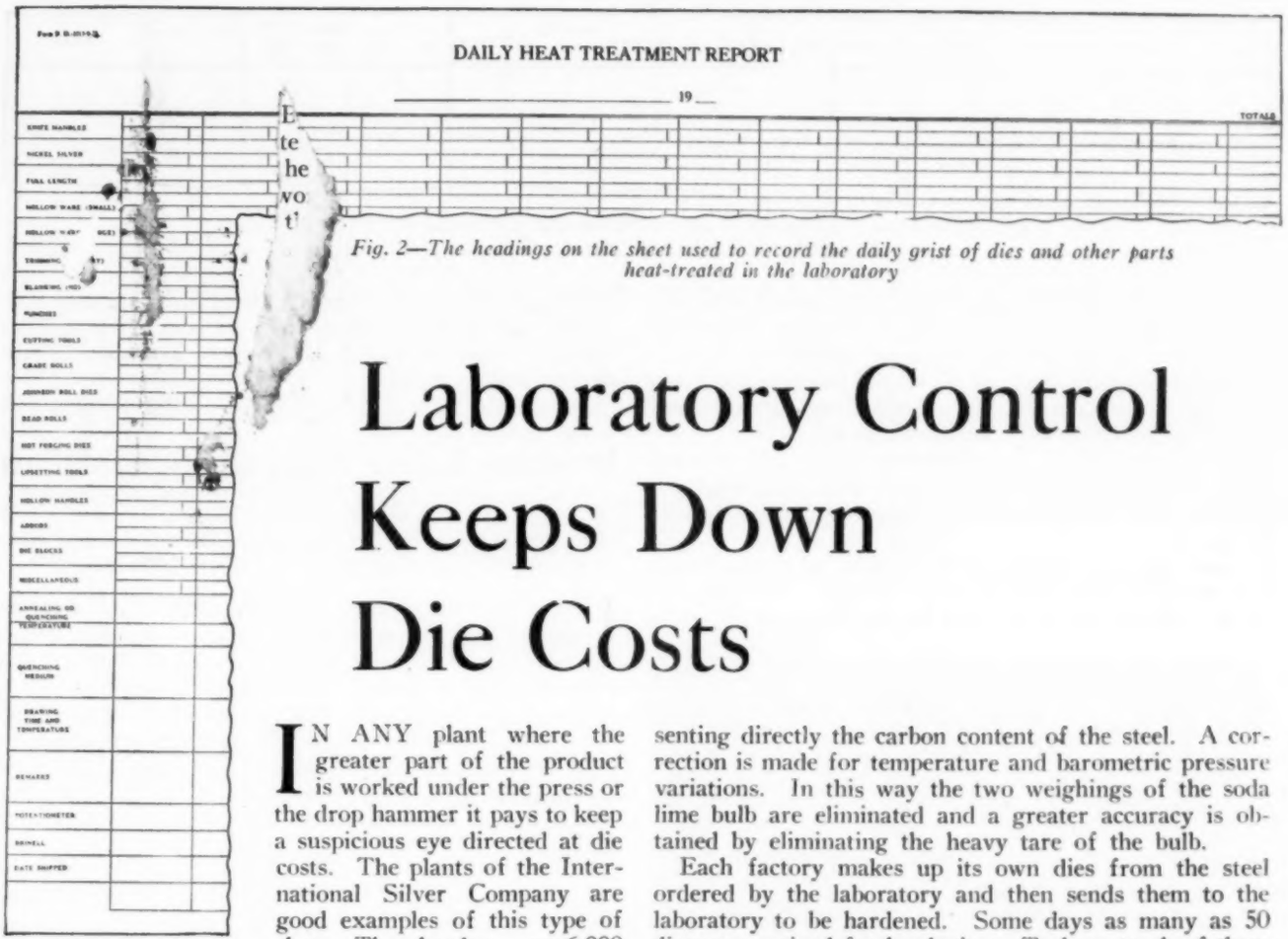


Fig. 2—The headings on the sheet used to record the daily grist of dies and other parts heat-treated in the laboratory

Laboratory Control Keeps Down Die Costs

IN ANY plant where the greater part of the product is worked under the press or the drop hammer it pays to keep a suspicious eye directed at die costs. The plants of the International Silver Company are good examples of this type of shop. They harden some 6,000 to 8,000 dies annually. That not over three or four of these dies broke in hardening indicates clearly that die costs are under control, which in turn implies careful control of die fabrication.

To accomplish this end the control must begin with the raw material, the die steel. As stated in a previous article, buying is a sort of co-operative endeavor between the purchasing department and the research and testing laboratory staff. The laboratory has developed accurate specifications for the steels to be used in making the various types of dies and has tested samples submitted by various manufacturers to determine the steel best suited for the needs of the factories.

Outside the present main sources other suppliers can always submit samples to the laboratory for analysis and testing. From this it will be evident that a would-be supplier must first sell the metallurgist of the company on the merits of his product before discussing deliveries and prices with the purchasing department.

Tool steel wanted by the factories is bought by the purchasing department on order from the metallurgist and stored in the laboratory. A chemical analysis of each heat is made and a micro-section from each bar. A disk is cut from each end and hardened and fractured.

With so many specimens to be analyzed it is necessary to employ the quickest possible method of determining carbon content. To this end a gas measuring flask, which takes the place of the usual soda lime absorption bulb, is used. The total volume of oxygen gas used during combustion, as well as the products of combustion, is measured in this flask. After extracting the CO_2 a reading in percentage on the graduated flask can be made, representing directly the carbon content of the steel. A correction is made for temperature and barometric pressure variations. In this way the two weighings of the soda lime bulb are eliminated and a greater accuracy is obtained by eliminating the heavy tare of the bulb.

Each factory makes up its own dies from the steel ordered by the laboratory and then sends them to the laboratory to be hardened. Some days as many as 50 dies are received for hardening. To keep track of them it has been found necessary to keep rather elaborate records.

A card is kept for each die which shows finally a complete history of that die including its record of production before failure or discarding. A study of Fig. 1 which shows both sides of the card will tell what information is thought to be worth having.

The card is filled out from the daily heat-treatment report, Fig. 2. It accompanies the die when it leaves the

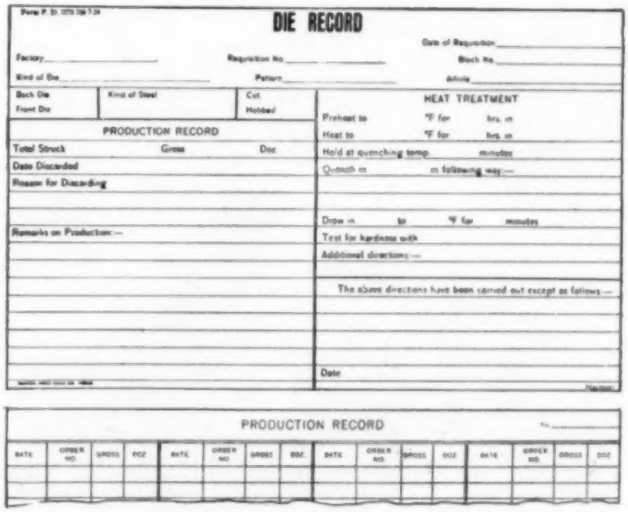


Fig. 1—Both sides of the record card that accompanies each die from the time it leaves the laboratory until it is finally discarded

											DATE			STEEL AS RECEIVED					REMARKS

Fig. 3—The permanent record of die treatment and performance. This sheet may be considered as a ledger page showing laboratory activity

laboratory after heat treatment and is returned when the die is discarded. If the old die is annealed, re-cut and re-hardened a new card is made out for it.

The die record sheet, of which the headngs are given in Fig. 3, is made up from the die record cards and serves as the laboratory performance ledger.

Numbering of the dies conforms to a regular system. Each bar of steel is given a number as it is received and the two ends are immediately designated respectively as A and B.

Dies cut from either end are numbered consecutively according to their distance from the end. For instance, a die marked 500-A-3 would be the third die cut from the A end of a steel bar that had been given number 500.

The heat-treating equipment in the laboratory as illustrated in Figs. 4 and 5 is the best available. Only electric heat is used.

Figs. 4 and 5—Two views of the hardening room in the research laboratory. All equipment is elctrically heated and controlled

Working Under Assorted Illuminations

By M. Luckiesh

Director, Lighting Research Laboratory National Lamp Works of General Electric Company, Nela Park, Cleveland, Ohio

IN ORDINARY work the eyes shift about and see objects, first in one place, and then in another where the intensity of illumination may be far different. The eyes are thus continually adjusting and adapting themselves to new conditions. A situation which requires the eyes to shift between bright and dark areas is unfavorable for quick and clear seeing. The high intensity of the brighter area of itself aids vision, but the necessity for continual readaptation to the darker area acts as a handicap.

An investigation was conducted in which objects were to be seen alternately in a bright area and an adjacent darker area, placed somewhat as the two pages of an open book. In order to have a basis for comparison, the experiment was repeated with the two areas equally illuminated; that is, of the same brightness. The table summarizes the results of about 400,000 observations.

	FOOT-CANDLES		
Lighting Condition	Left Area	Right Area	Relative Rate of Work
Uniform illumination	20	20	100.0
Unequal illumination	20	5	96.8
Uniform illumination	5	5	99.0
Uniform illumination	20	20	100.0
Unequal illumination	20	1	89.9
Uniform illumination	1	1	92.3
Uniform illumination	5	5	100.0
Unequal illumination	5	1	92.7
Uniform illumination	1	1	91.1

These results indicate the disadvantage of requiring the eyes to work over areas of different brightnesses. When the intensity of illumination is high enough to afford fair vision and the brightness-difference between various areas is not excessive (first group of data) the disadvantage is slight. However, when there is a large difference between the darker and brighter areas (second group of data) the effect of an assortment of illumination is serious. It is also of consequence where the intensity of illumination is low, even though the difference between the darker and brighter areas is not great (third group of data).

The "average value" of illumination is a wholly misleading guide. A deep shadow falling at one point where vision is critical may defeat the original purpose of the designer.

Setting Prices on Special Machines

HENRY HARPER was up against a problem that confronts many managers at times. Business was a little slack in regular lines and he had the chance to build some special machines. But, as usual, the customer didn't see why he should pay a special price for them. So, having heard about William Holland from some of his friends, he went to see him.

"Had any experience in building special machinery, Mr. Holland?"

"Quite a lot, Mr. Harper—first and last, and not all of it pleasant or profitable. What's your trouble?"

"Well, you see, we are a bit slack on regular work and the Blank Works want us to build them some semi-special drilling machines. They seem to resemble our standard line a little, but as I study the drawings there are not many standard parts we can use except some pins, bolts, nuts and the like."

"That's usually the way, Mr. Harper. But the Blank Company probably thinks that only a few changes are necessary. How many machines do they want?"

"One, *now*, but if it works out well, they can probably use a dozen, later."

"And they probably want a price based on the total they *may* use later."

"Why, yes, in a way. They did mention that this would give me a chance to distribute some of the costs on later machines so the first machine wouldn't be so high and the board of directors wouldn't kick."

"Same old story, Mr. Harper, but they don't always drag in the board of directors, that's a little variation."

"Don't you think they mean it, Mr. Holland?"

"They probably think they do—now. But unless you have them sewed up with a contract to take the other twelve machines within a certain time, it's ten to one you'll never build more than the first. That 'board of directors' will probably step in and order the machines from some shop that thinks it's good business to copy the machine you've built—at a lower price."

"Just what would you suggest, Mr. Holland?"

"This reminds me of a case I knew some years ago, Mr. Harper. Friend of mine in the Middle West. He figured it out about this way:

"He wouldn't consider anything but the one machine first. Made the price high enough to cover his development costs—plus his drawings, patterns and special material—plus the labor and overhead—plus a liberal profit. He didn't uphold profiteering, in war or in peace, but he said that machine builders must remember that the machine which nets them *one* profit, earns money for the user day after day, as long as it runs.

"The first machine does cost a lot of money—which the man who gets it ought to pay for. Unless he does, you lose money. He believed it better to risk losing the order than to get customers in the habit of thinking he was an easy mark."

"But I want the order—and I want to make money, too, Mr. Holland. How would you do it?"

"My friend considered that there were two ways to handle it. One—and he thought it the safest—was to make a price for the first machine, covering the various items he mentioned. Then he quoted a price for other machines, both singly and in lots of three, six or twelve. His idea was that if he put all the costs he should into the first machine, the board of directors would think they were getting the rest at a bargain.

"His second plan was to name a lower price on the first machine, contingent on a signed contract to take the rest on given dates. There ought to have been a forfeit posted but he felt that was out of the question. The first plan seemed the safest to him and he followed it."

Executives are invited to discuss the problem involved in the foregoing case. Accepted contributions will be paid for.

EXECUTIVE FORUM

Discussion

The Privileged Class

There appears to be considerable justification for Arthur Wales to place the major portion of the blame on the chief engineer's shoulders in his explosive analysis of the difficulty at the Atlas Corporation. It is perfectly feasible to schedule engineering work; in fact it is being done more and more. By scheduling, I don't mean merely making a verbal promise of Tuesday or Wednesday nor the end of the week or month, but an actual position and date on the production chart that carries the job through the shops. To be successful the chief engineer's "dates" should be accepted as far as possible without question—for if an attempt is made to crowd him on general principles, "speeding up the work" on all jobs, the system will destroy itself. When a certain short job, such as that under discussion, is needed in a rush, it should not come to him merely as a routine job with a rush sticker on it; he should be definitely advised by the manager that it is urgent, so that he can give it his personal attention.

Many jobs that are extremely important to the shops, such as bills of material on big production jobs, are of only minor interest to the strictly engineering mind. Yet an experimental machine, the construction of even a test unit of which has not as yet been authorized, may be of extreme interest from the engineering viewpoint.

The production manager should make a confidant and a friend of his chief engineer, and in so doing give him the opportunity to "smell the saw dust" of shop production speeds. If the chief engineer can be gotten away from the strictly engineering viewpoint, so that he will think of his department as a "service" department, the problem will be solved—for after all, he has a keen analytical mind or else he wouldn't be chief engineer.

—SAMUEL J. BAVIS.

Allowances for Old Machines

A machine tool should not be replaced until it has reached the point where it can profitably be replaced by a new machine when figuring the salvage of the old machine as being equal to its junk value. Obviously, then, the owner of the unprofitable old machine cannot compute its true worth to him in terms of its usefulness to another manufacturer but rather in terms of what it can be sold for on the open market. Its market value may quickly be determined by offering it for sale to those that specialize in the handling of second-hand machinery. If a rival of the maker of the machine offers much more for the old machine on a new one than it is worth on the market, the difference can be construed only as a price cut on the new machine.

This price cut on a machine with which the prospective purchaser is somewhat unfamiliar should cause him to go slowly, especially when the manufacturer of machines which he concedes are the best on the market refuses to shade his price.

Aside from the disadvantages of dealing with a cut-price manufacturer and buying a machine that may or may not be as good as the old make there are other disadvantages in changing from one line of machines to another that are independent of the respective prices and merits of the two makes. Considerable time is consumed in acquainting the operators, foremen, maintenance men, and tool designers with the operation, range, and capacity of the new make of machines. The output is apt to be small until the operators have become familiar with the operation of the new machine. If a production bonus or time-study rate is in effect it will have to be changed.

—W. L. ROMICK.

Handling Decreased Production

To make up stock in dull periods has a hazard. A period of depression is a time for tightening up on both the planning and inspection departments. The 100 per cent tenseness that exists under peaks of heavy production is absent among those responsible for results. This "change of pace" exists even in the ranks of the men at the machines, where it is mirrored from the attitude of their immediate superiors. Taxing capacity has a tonic effect on everybody. Relaxation from the strain means errors creeping into the work and any inspector will tell you that he would rather have the plant taxed.

The planning department will bear watching when stock is made up in quiet spells. Relaxing from the strain of quick delivery promises, too much emphasis is apt to be given to the maintaining of machine set-ups, while urgently required custom work suffers. Even the machine hands growl at having to break a set-up.

If inferior workmanship can be eliminated and the customers who are buying taken care of, we are in a position to consider making up stock. First, we must be assured of the quality of the goods going into stock. Second, take care of the customers who are buying with good deliveries. Third, fill out the broken lines. Fourth, keep the stock inventories within reason. Fifth, borrow as little as possible to do it.

—GEORGE E. HODGES.

How Lancia Eliminates the Front Axle

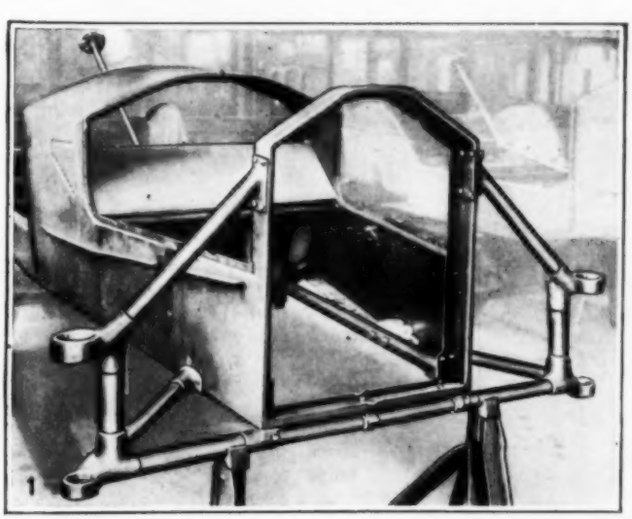
By J. A. Lucas

Instead of the usual spring-suspended front axle, the wheels are mounted in a rigid framework that is part of the body and have independent coil springs and hydraulic shock absorbers

THE construction of the member supporting the front wheels of the Lancia car—it can hardly be called an axle in the usual sense—is as unusual as the construction of the body itself. The wheel suspension is built up of several tubular members, and the whole framework is riveted to the front end of the body, as can be seen in Fig. 1. This illustration shows its construction and the method of attachment, while Fig. 2 shows the way in which the frame is built up in a substantial fixture, so as to insure its fitting the body when ready for final assembly. The forgings, in which both ends of the steering knuckle bear, are positioned at each end of the horizontal tube, riveted and then brazed into position, using the gas torch as in Fig. 3. It will be noted that the framework remains bolted to a central jig, which represents the front end of the body, and that it remains on the jig while being brazed so as to insure that the various members will be held in correct position until all the joints have been completely brazed. The frame is mounted on a stand that can be adjusted in any desired direction, so as to enable the operator to work in the most advantageous position on any joint. The torch method has been finally adopted in preference to that of dip-brazing as having proved more satisfactory.

After the frame has been completely brazed, it is removed from the fixture and goes to the special machine shown in Fig. 4, where the bearings for the knuckles are machined. Here again the framework is mounted on a fixture that is a duplicate of the front end of the car, and the four pads are fastened in position by the method shown at *A*. The outer ends of the framework are supported as at *B*, while clamps at *C* help to hold it firmly during the boring operation.

Each boring head is independent and has its own motor. Alignment is secured by having the two boring bars guided at each end and driven by flexible couplings.



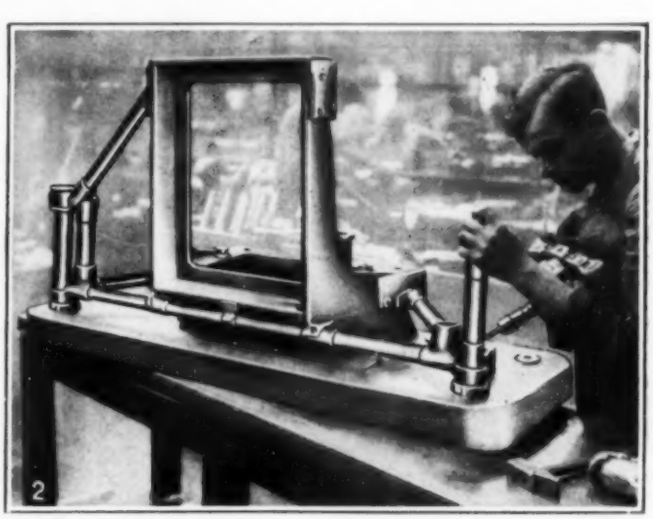


Fig. 1—Front-wheel suspension-framework attached to body ready for further assembly. The framework is built up of steel forgings and tubing, and when fastened to the body and radiator shell makes a very stiff structure. Fig. 2—Fixture in which the front-end framework is assembled. This consists of a heavy base with bushed holes that carry plugs or mandrels for properly locating the steering-knuckle forgings. All the joints are pinned and brazed

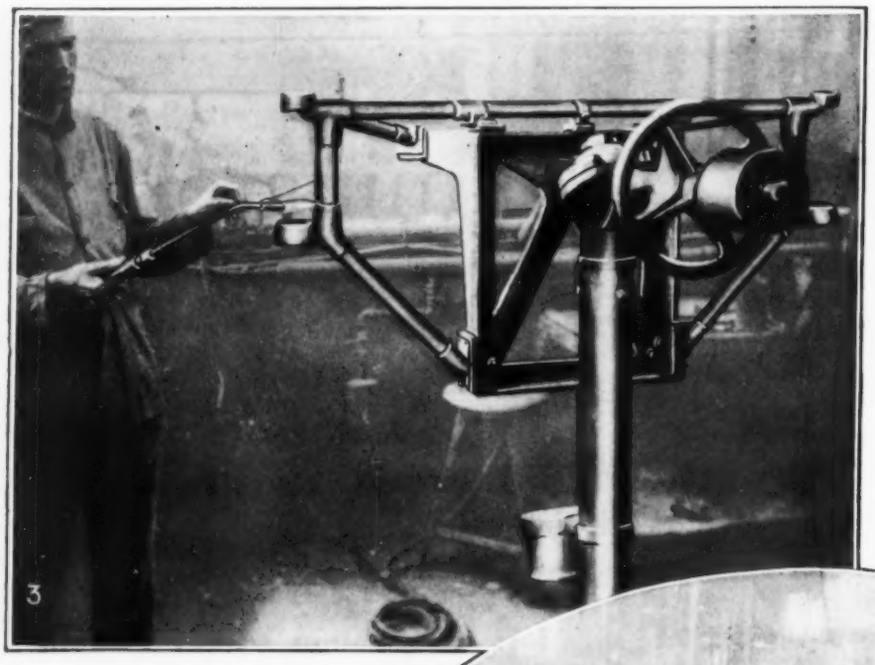


Fig. 3—Brazing the various joints. The central part of the fixture on which the parts were assembled, remains in place and is mounted on the brazing stand shown. The stand has a ball-joint connection, so that the work can be moved into any desired position for the convenience of the operator. Gas-torch brazing has been found more satisfactory than the dipping process

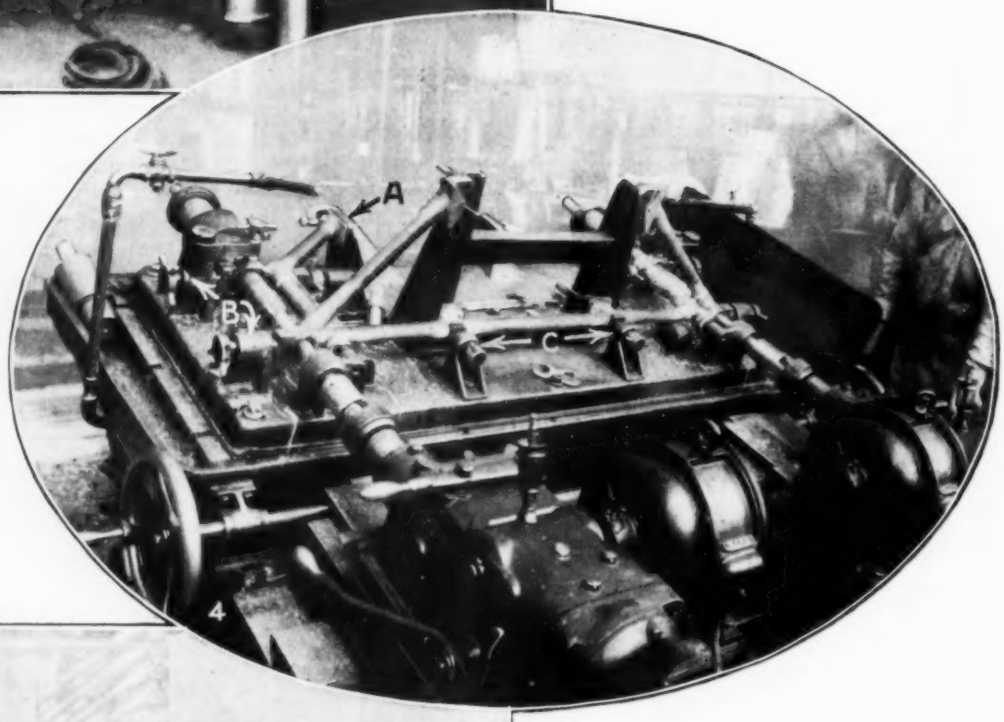


Fig. 4—Special boring machine for steering - knuckle bearings. The framework is positioned and clamped in suitable fixtures so as to secure alignment in the boring. Both boring bars are guided in substantial bushings and are driven by flexible couplings

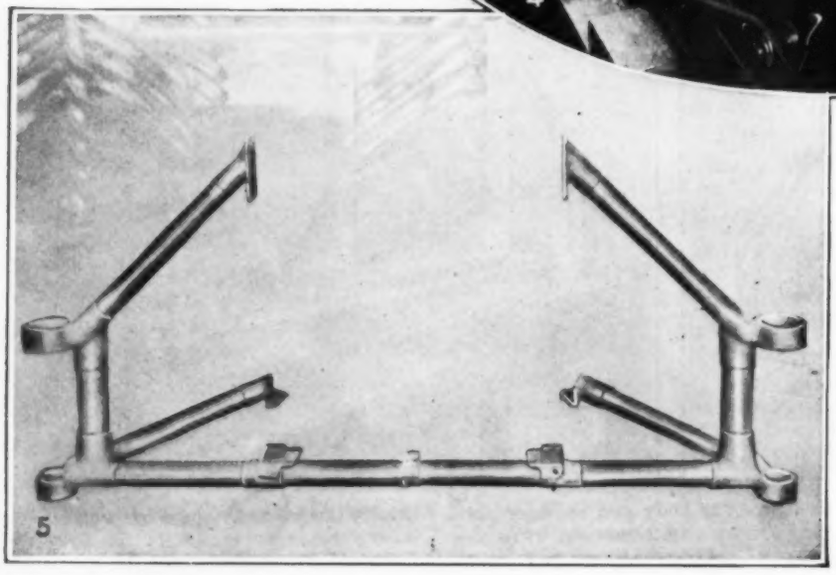


Fig. 5 — The completed front-wheel suspension-framework ready for assembly to the body. This view shows the construction of the complete assembly, consisting of eight main forgings connected by steel tubing

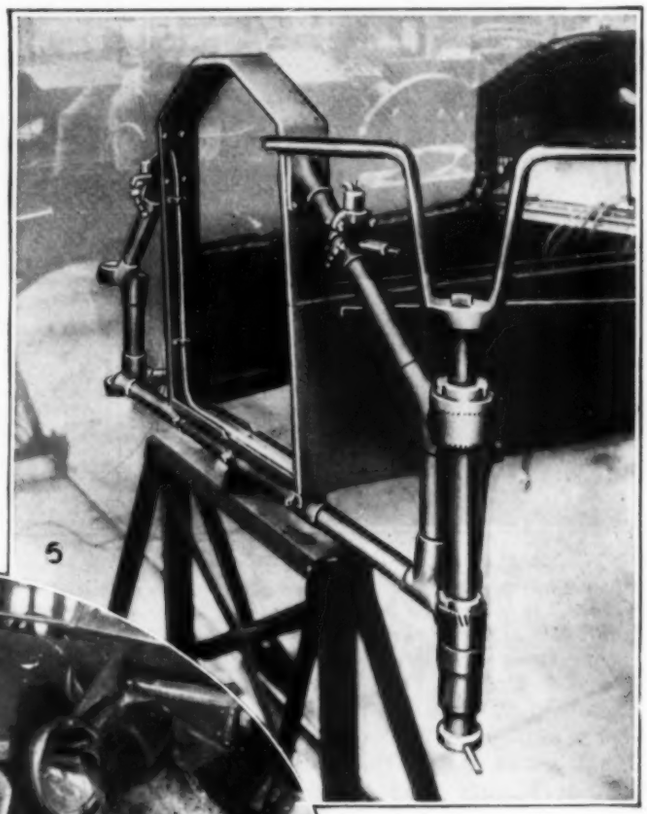


Fig. 6 — Wheel-suspension framework assembled on front and end of body and being finish reamed and faced for the steering-knuckle bearing. This view shows how the front end is supported during the operation, and also the method of attaching the lamp brackets, which are a part of the center support

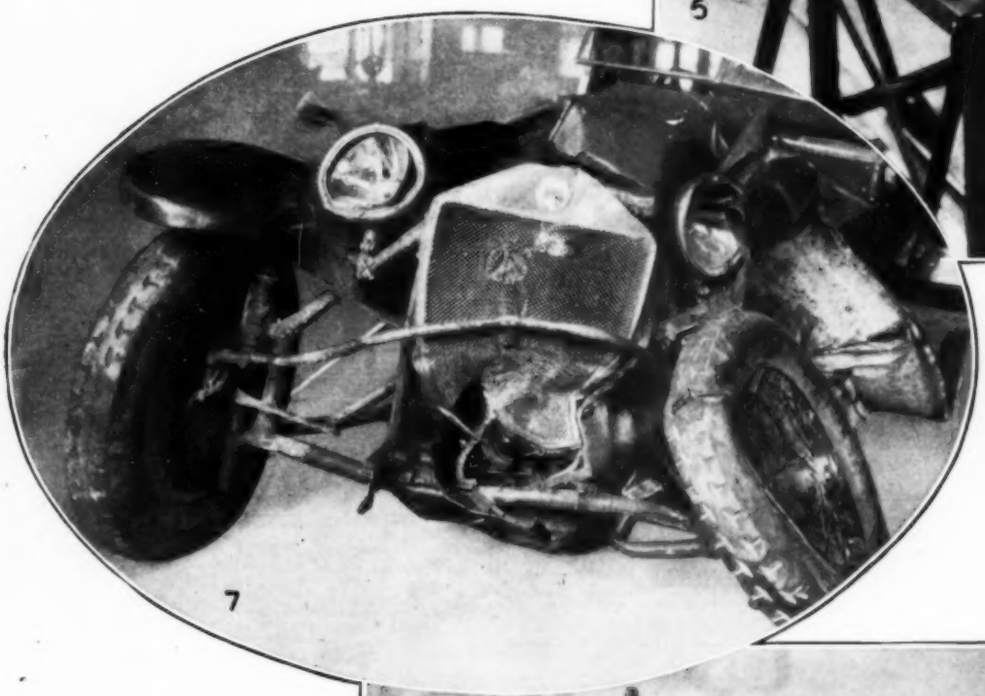


Fig. 7 — A wrecked front-end caused by colliding with a heavy stone pillar. This illustration shows to what extent the front-axle suspension was deformed and also how the headlight and front fenders are supported by brackets on the angular brace

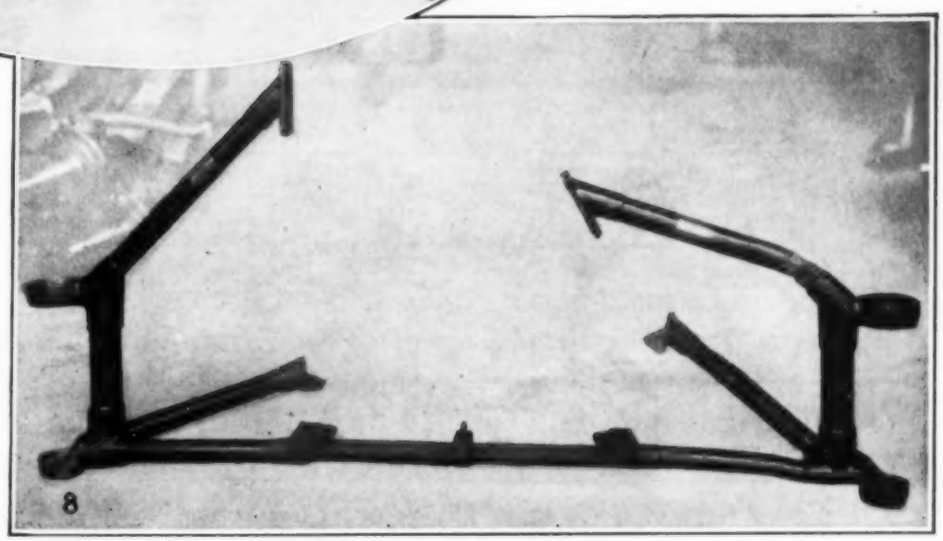


Fig. 8 — The same front-wheel suspension partially restored to shape and in a fair way to regaining its normal contour. The straightening is done by means of the gas torch and suitable fixtures that are part of the equipment of every Lancia service station

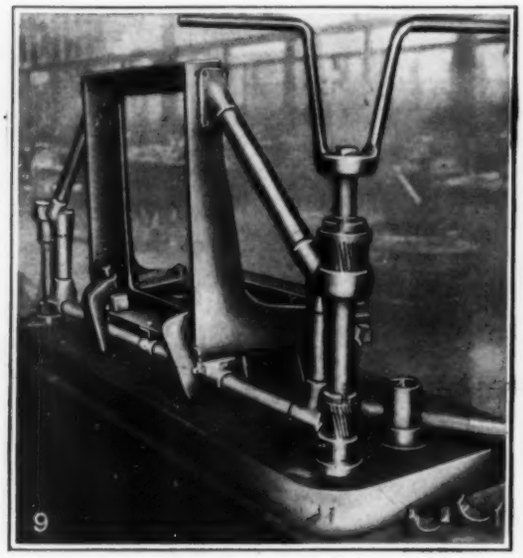


Fig. 9—Here the wheel suspension frame has been restored to its original shape. It is mounted on the same type of fixture as that shown in Fig. 2, and is being reamed for the steering-knuckle bearing so as to insure correct alignment when reassembled to its own body.

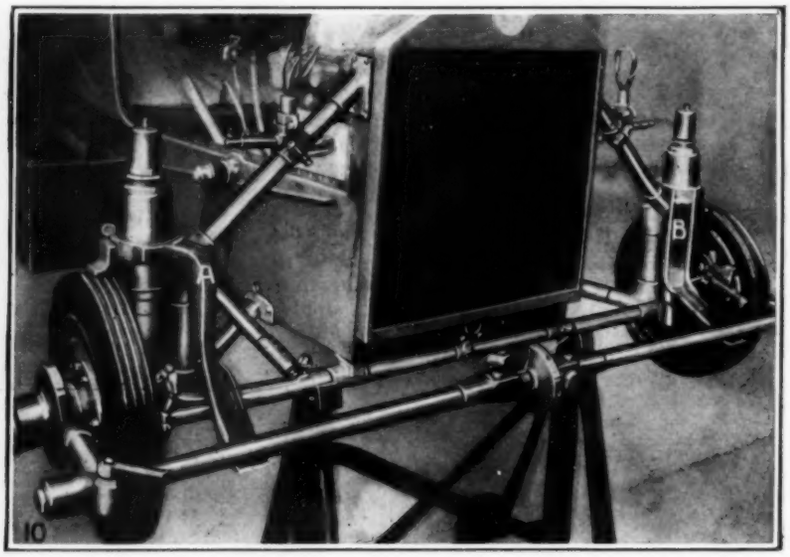


Fig. 10—An aligning gage for checking the angularity and toe-in of the front wheels. The gage is positioned by the two arms that fit over the hydraulic shock-absorbers, and the adjustment in the center of the rod shows how much correction must be made in the steering mechanism

Details of this machine are shown in Figs. 11 and 12.

The completed framework is shown in Fig. 5, while Fig. 6 shows it assembled to the body, and the steering-knuckle bearing being reamed and faced by hand as a last operation.

Lest someone get the idea that this front-end construction is fragile, or that it is unusually difficult to repair, I am fortunate in being able to present photographs of a wreck that occurred under my eyes and was photographed immediately afterwards. I have never seen a worse looking wreck, nor one that looked more hopeless as to repairs. As can be seen in Fig. 7, the braces on one side were completely torn from the body and badly deformed. However, the repairs were successfully made.

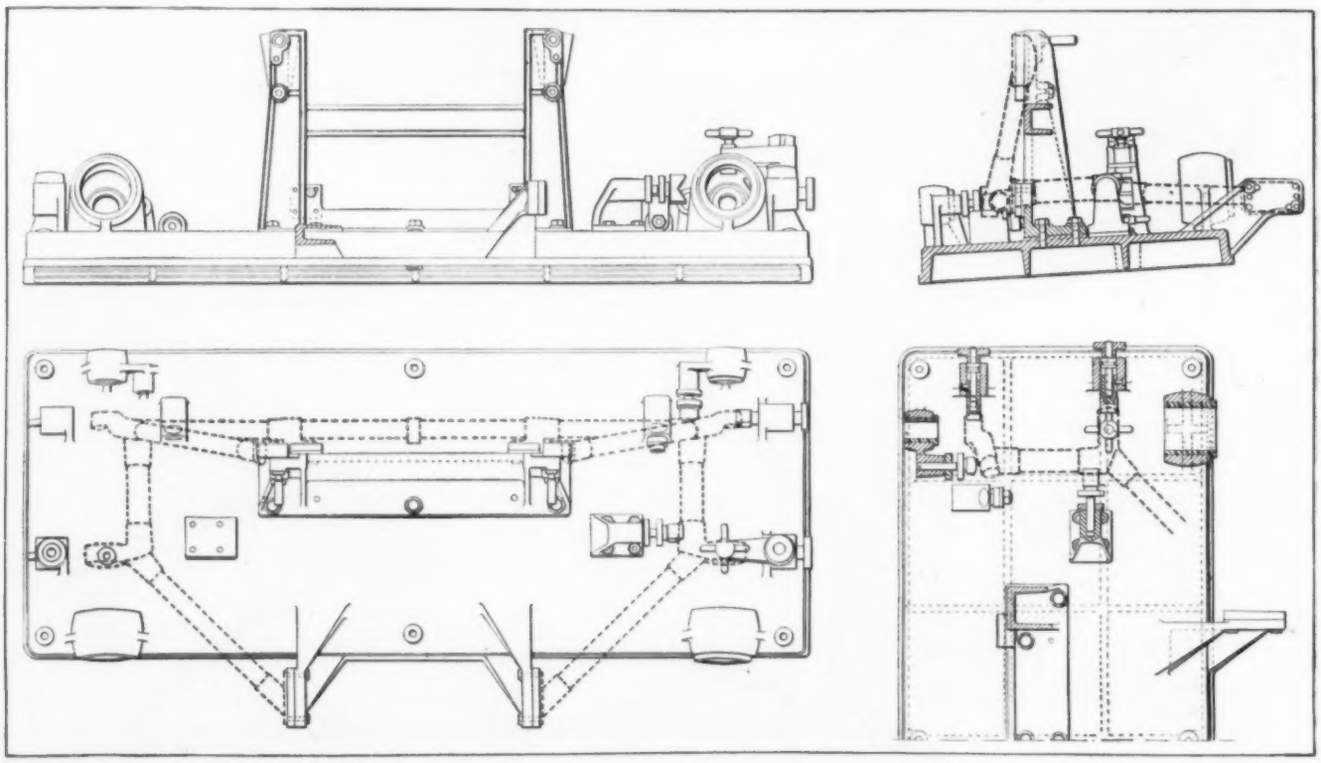


*Fig. 11—**General** layout of special fixture for holding the front axle frame during the drilling. **The drawing** shows the way in which the frame is located and supported*

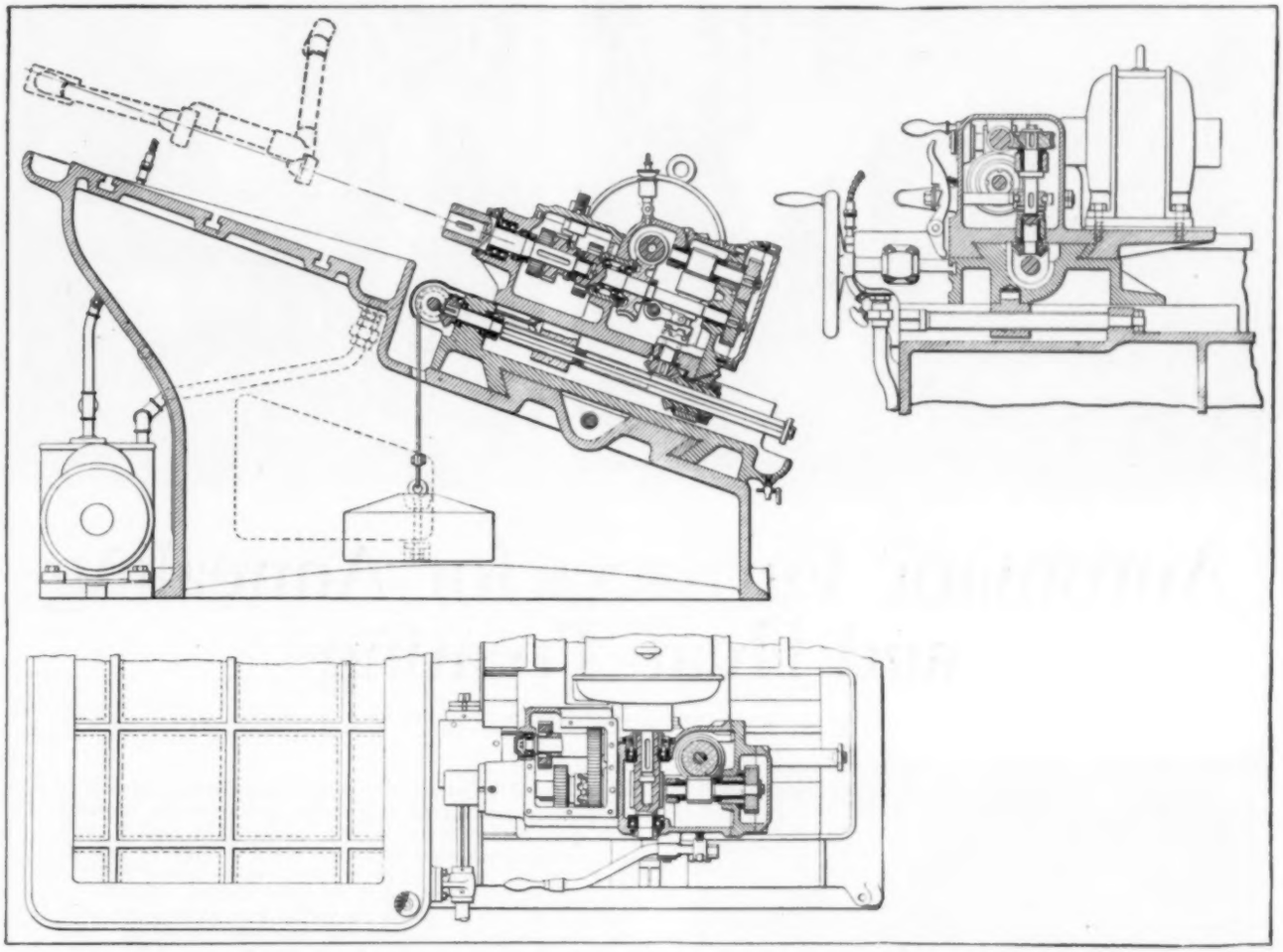


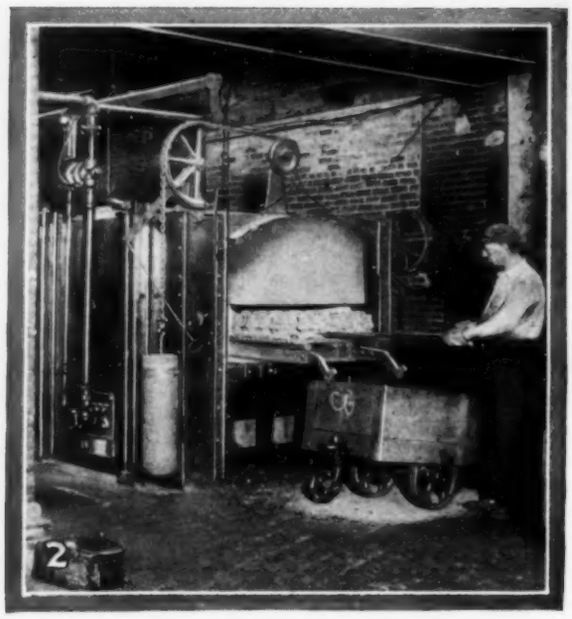
Fig. 12—Details of the front-axle boring machine. The bed and spindles are on an angle for convenience in handling the work. A weight is used for feeding the drill spindles

In Fig. 8 is this same front framework partially restored to its former shape by the use of the gas torch, while Fig. 9 shows it completely corrected and in place on the assembling fixture. Here the steering knuckle bearings are being reamed and faced. Fixtures for straightening bent portions of the framework and for securing proper alignment by reaming are supplied to service stations, so that repairs of this kind can be quickly made at points far distant from the factory.

Another fixture used in this connection, both at the factory and by service stations, is shown in Fig. 10. This fixture checks the alignment of the front wheels, and incidentally of the brake drums. The arms of the fixture, *A* and *B*, go over the hydraulic shock absorbers and support the crossbar in position to check the alignment of the front wheels. The adjustment in the center of the front bar shows exactly how much out of line the wheels may be and enables them to be corrected.

Accuracy in Large Machine Tools

So much emphasis has been placed on the increased productive capacity of machine tools and on their ability to save their cost in a few months, or years, that the truly remarkable standards of accuracy that characterize their construction are lost sight of. This matter of accuracy is given attention in two articles, the first of which will be published in the next issue. The second will appear soon thereafter.



Automatic Furnaces for Annealing and Heat-Treating

Photographs by courtesy of the Warner Gear Company

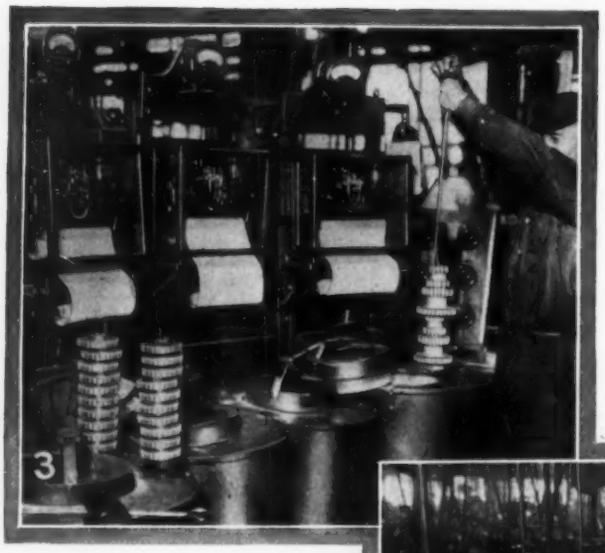


Fig. 1—Loading end of an automatic normalizing and annealing furnace. Annealed work helps production by allowing tools to be used at higher cutting speeds. The work is piled on the corrugated metal sheets and is fed through the furnace on a conveyor so timed as to maintain the proper heat

Fig. 2—The discharge end of the same furnace. The corrugated sheets are pushed down on the bent ends of the rails and the charge is dumped into the wheeled truck. The forgings are normalized at 1,650 deg. F., cooled in air to 500 deg. F. and then annealed at 1,250 deg. F. The furnace requires a minimum of attendance

Fig. 3—A section of the "hump" furnaces used in heat-treating gears. This furnace is part of a battery that is so arranged as to be easily handled with a minimum of labor. Gears of all kinds are heat-treated here, both the single gears shown at the left and the cluster gears at the right. Each furnace has its own recording and controlling pyrometer

Fig. 4—General view showing ten of the fourteen "hump" furnaces that go to make up the battery. The furnaces are located right in the shop as part of the production line so as to avoid unnecessary movements of material. They are arranged in an arc and the quenching tank is in the center, this arrangement being not only convenient but enabling one man to handle the whole battery. Gears are afterward drawn in oil in an automatic furnace that removes the work after a given period

Some Experiences in Price Cutting

By Earl Whitehorne

Assistant Vice-President, McGraw-Hill Publishing Company, Inc.

A close-up picture of the present tension in the equipment market—Why seller and purchaser are at loggerheads—Examples from the electrical industry—What should be done

In a recent article entitled "Who Pays the Cost of Price Cutting?" Mr. Whitehorne discussed some aspects of the present buyers' market. It was recommended that secrecy be eliminated wherever bidders are called upon to reduce a price after bids are in, and that the salesman should demand a showdown and not accept the mere statement that he is high. This article carries the discussion on, citing intimate conditions

IN ANY discussion of the evils of price cutting, sooner or later the talk must get down to cases. It is perfectly natural and practical and proper for the purchasing agent to buy as cheaply as he can. And it is no less right for the manufacturer who sells the goods to get as profitable a price as possible. But in the evolution of business certain principles have developed, and certain responsibilities. The trickery that once was the life and sparkle of horse trading is now frowned upon. Fair dealing has become the accepted standard in commerce, a live and let live policy that considers as satisfactory only a transaction that is of benefit to both contracting parties. The seller is supposed to give honest value and the buyer is expected to pay an honest price. Why then is there so much talk right now of trouble between large buyers and sellers? What has gone wrong in the market place that there is bitter talk of price cutting by manufacturers and profiteering by purchasers? Study it a bit and you find an interesting thing. There are some manufacturers who have the courage to establish prices and maintain them. Their price is their price and they refuse to dicker. But there are some who lack the courage or the strength. And just so there are some purchasing agents who do not haggle. They ask for bids from suppliers whose product is acceptable and the low man gets the business. But there are others who seem to consider their function one of dollar squeezing; and the length to which this gentle art is carried is astonishing. By way of illustration let's just consider a few examples from the electrical industry.

Case No. 1

One very large company has a purchasing agent who evidently controls the engineering department; his method is as follows:

The engineers confer with salesmen of various manufacturers and, after getting the needed information, issue specifications giving the amounts of apparatus desired, item by item. These are then turned over to the purchasing department and bids called for.

The bids, when received from the manufacturers, go to the engineering department, are tabulated and analyzed. After this procedure they are handed to the purchasing department with the recommendations as to what the engineers would like. These engineers know what they want but are required by the purchasing agent to give the names of at least three manufacturers whose apparatus would be acceptable—although the engineers, from an operating standpoint, would probably know definitely that one particular type of apparatus or one particular manufacturer would give the best results.

The purchasing agent then notifies the various bidders to appear at his office on a certain date and the result is a flock of salesmen—the majority of whom never had a chance but do not know it—as their names are *not* included in the engineers' recommendations to the purchasing agent. The purchasing agent then retires to a large conference room and calls in his group of engineers—sometimes as many as thirty. One by one the salesmen, those who have a chance and those who never had, are stood up before this imposing group. It is like a man at the bar facing a judge and jury. The purchasing agent, a very imposing individual, then holds up a bid asking the trembling salesman if it is his. Admitting the charge, the purchasing agent barks out, "Is this your lowest bid—you have one chance to cut the price." And so the bidding goes, until the harassed salesmen paint, by telephone or telegraph, to their main offices, a story of the battle as they see it. Usually, the story is utter defeat unless the price is reduced. In a few hours each is called in to report again and given another last chance and somebody weakens. Then, after all this, the three representatives of the manufacturers selected by the engineers are again called in one by one. They are then given another chance to cut the price—so one by one they are worn down and one of the three eventually weakens. The net result is that some manufacturer takes a loss—the other two are sore, revengeful, and swear to get even the next time with the manufacturer to whom the business was awarded.

When the next negotiation comes up it is usually awarded to some one other than the first successful bidder—and this goes on year after year.

Case No. 2

A practice more or less common in a large company is to issue calls for bids on a certain specification. After all the proposals are in the purchasing department tabulates them, and calling in the bidders one by one, each is told or led to believe they are a little high in price. Finally one decides to meet or better the lowest bid submitted. All are in a round-about way given an idea as to the amount of the lowest bid, told to get in touch with their fac-

tories and sharpen their pencils preparatory to doing the same thing.

As a result, one or more of the manufacturers "bite" and come in with a still lower bid to "get in," as the salesman often says. This is especially true of some one who considers himself an outsider or has never been successful in securing business from this particular buyer.

When the purchasing agent has interviewed the entire list and held them on "hooks" for a time, all the bidders are notified that the specifications have been changed by the engineers and new bids will be called for.

Practically all the time and expense of the first bids are thus lost and the merry-go-round starts all over again. Each one having spent considerable money by this time, some decide to go after the business hard in the hope of saving something out of the wreck. The net result is a free-for-all-fight, but the business usually goes to the manufacturer the purchasing agent has had in mind all the time—at a lower price.

The majority of the bidders never had a chance, but were systematically used to beat down the price. This method of procedure not only costs apparatus manufacturers a great deal of time and money but also wastes time and money for the purchasing and engineering organizations.

Case No. 3

Some purchasing agents insist on a lump sum price on all major electrical apparatus required on a job. This lump sum might include transformers, oil circuit breakers, disconnecting switches, air break switches, switchboards, regulators, outdoor substations and cable. There are very few companies in this country who are in a position to offer such a complete bid. The smaller or specialized manufacturers are at a disadvantage when the engineers favor their equipment for a certain portion of the work—but the purchasing agents insist on a lump sum bid. In order to obtain the lowest price, the purchasing agent will often ask the larger companies the amount of reduction they will make in case a certain item is eliminated from the lump sum bid. In order to protect their lump sum bid the larger companies' deduction will naturally be less than it should be when in straight competition. The smaller manufacturers who cannot bid on the entire specification, but who may have equipment more suitable for the work desired by the engineers—are advised by the purchasing agent that they can have a certain portion of the business by taking it at a figure *equal* to the larger companies' deduction on that item from the lump sum bid.

By this method the smaller manufacturers are therefore offered the business at a price very much under the normal price and if one of them takes it he is quite apt to lose money. On the other hand, if refused the business the purchasing agent will tell him that he was high in price and the business went to one company on a lump sum basis.

Case No. 4

One large purchaser of apparatus has a purchasing department which has successfully carried out the following plan:

Bids are called for, on say 21 items, all of which can be supplied by one of several manufacturers. The bids specify itemized prices and a lump sum proposition.

The purchasing agent carefully picks out from all the bids the lowest price on each item. One man may be much lower in item 7. The purchasing agent then makes up his own lump sum proposition. Should any of the bidders in their proposition state that on a lump sum basis they will give a further reduction of say 5 or 10 per cent, the purchasing agent also takes this off his own lump sum tabulation.

The manufacturers' salesmen are then summoned and each one in one way or another learns that the purchasing agent has a lump sum figure considerably lower than that quoted by the salesmen—who quickly wires the factory. In some instances the salesmen actually find out the exact lump sum figure referred to.

The net result is that the purchasing agent, by setting up this artificial lump sum figure, generally succeeds in knocking down the price of the manufacturer with whom he intended doing business from the start or whose apparatus is really specified and wanted by the engineering department.

Case No. 5

In a recent purchase of a large order five manufacturers bid. One was very high and was counted out. Three were low. The purchasing agent sent for the other bidder who was next below the high and told him that their equipment was desired and offered to give this firm the order at a price to be set by averaging the three low bids and adding 10 per cent. This is an inaccurate way to establish the value of electrical machinery, to say the least, but he took the order at the price offered.

Case No. 6

A purchasing agent asked for bids on a number of large machines involving a considerable element of design and engineering. The purchaser's engineer stressed the need for the highest efficiency obtainable. Several bids were entered involving a large expense. The high man was told that he would have to cut so many thousand dollars if he was to get the order. The purchasing agent asked the salesman, "Why should you expect to get so much more money than the X-Y-Z Company for the same sized machines?" The sales engineer said, "Mr. Pricer, there are very specific reasons based on definite engineering considerations, why our machines are worth more money to you. But there is no point in my taking your time to go all over them because you are not an engineer and will not understand the values that I am talking about. But I will be glad to go all over it with your engineer. If I can convince him that our machines are worth that much more than the X-Y-Z, will you consider this added value as a factor in our bid?" And the purchasing agent said "No, each company must be on a par and the price decides it." And that was that.

To the Purchaser

INDUSTRY needs more intelligent buying. It needs purchasing agents who know the values of the equipment they buy, and make of their function something more than an adroit matching of prices. It needs frank open recognition of the fact that what is bought must be paid for and that bids which embrace elements of engineering, and of service as well as the delivered product, cannot be compared by a mere tallying of the total cost figures.

Therefore, the time must come—will come—when the purchasing agent no longer shall be rated for his penny-squeezing ability, but for his engineering skill in sensing and securing the greatest values for the money spent.

Typical Situations

The number and variety of these cases are without end, but there stand out certain typical situations, some of which are listed below:

1. Where the purchasing agent gets the high bidder to cut on the indefinite promise of a large block of business next year.
2. Where the buyer lies, giving a bidder the false intimation as to his competitor's price, or representing the competing price on motors alone, for instance, as the complete price for motors and control, or citing a price on equipment that is not comparable, or ringing some other subtle change on the truth that deceives and tempts the manufacturer to cut.
3. Where the large buyer demands special discounts for large volume claiming that this volume carries the manufacturers overhead, and thus forces the big manufacturers' price down to where the small manufacturer cannot compete.
4. Where very large buyers of electrical equipment that is used as part of a manufactured product threaten to make their own motor or control or whatever it is unless the price is cut.
5. Where large utility holding companies argue that one of the savings possible through holding company operation should show up as savings in purchasing, and demand discounts over prices given to operating companies, which eliminate the small manufacturer and force the large manufacturer's price below the margin that provides for the further development of bigger and better apparatus.
6. Where purchasing agents apparently do not know how to buy because they have no facts to check bids with and no methods of evaluating bids and therefore resort to haggling.

What the Seller Does

That's what they are saying about the purchasing agent—not all, of course—but many. But what is the matter with the manufacturer, you'll say, that he should submit to all this unsound and unfair treatment? Why does he fall for such methods? There is the rub. The manufacturer right now finds himself in a buyer's market. He is embarrassed in many fields by over capacity and over production. He has permitted himself to become involved in a mad scramble for orders that has enmeshed him until for every story reflecting upon the purchasing agent there are fourteen about manufacturer and his salesmen. As one man put it, "You can take a pure young man and make him a purchasing agent today and before Sunday the manufacturer's salesmen will have taught him all the dirty tricks in the business." The utility purchasing agents say that the manufacturers are themselves the greatest culprits and are responsible for price buying. They say that first bids today are made for trading purposes only and that the bidders come to them before the ink is dry on the bids and offer to cut the prices. Therefore, they say, they too must use trading methods because those are the methods that the manufacturers have developed and seem to understand. The purchasing agents say that they are willing to pay fair prices but that the manufacturers haven't the courage to put fair prices on their products and then stick to them. The small manufacturer also charges that although the large electrical manufacturers state that they desire competition and see no virtue in monopoly, yet they chafe under the competition of the small manufacturer and cut prices to get business, relying on price cutting and not on better quality, better delivery or better salesmanship to maintain their position. It is alleged that the spread of prices established by these larger manufacturers is unreasonably wide and is not justified by the savings effected in making and selling the larger quantity to the large buyer. Again the large manufacturer says that his responsibility to keep his plant busy gives him a natural right to price low at times on orders needed to load some department of his factory that is running short. The small manufacturers, he says, with low overhead, have ample advantage in the market place but rely too much on price paring and too little on engineering, service and quality of product. In this competition between the manufacturers also, certain typical conditions stand out:

Tricks of the Manufacturer

1. The large manufacturer uses the lump sum bid as a lever to lower prices on individual products to compete with the small producer who specializes in that line.
2. Allowances are made on old equipment taken back that range all the way from a reasonable scrap allowance to the full original price. This is pure price cutting when the allowance is more than the seller may expect to realize from the second hand value.
3. Some manufacturers are making extravagant contributions in preliminary engineering expense for detailed working data that is out of all reason and constitutes a price consideration.
4. Reciprocity arrangements are drawn into competitive bids to an extent that overshadows the actual comparative values involved and works an injustice upon bidders who are invited to compete with the assumption of a fair and open contest.
5. And then there are the everyday conditions of price cutting where the manufacturer loses his nerve and pares his price for no other purpose than to get the order and camouflages it with all manner of alibis and explanations. Here are a few of the usual experiences:

Case A

Purchaser in the market for a 000 hp., 000 r.p.m., synchronous motor. Low bidder $8,450 with other bids materially higher. One bidder receives a tip that other really higher bidder was $7,900. He revised his bid and took the order at that figure. The other bidder held his price and checked up afterwards and they found out.

Case B

A purchaser advised a bidder that he was getting an extra 5 per cent from the other bidders on some standard listed apparatus and that he would have to meet the figure. He did and it developed that the extra 5 was on a single order aggregating over $50,000.

Case C

A recent order was taken for $58,650 on specific information from the buyer that a certain manufacturer had made a price of $57,000. The original bid of the successful (?) bidder was $74,000. A later check-up disclosed that original bids ranged from $70,077 to $74,000 and no other changes were made.

Case D

A bid was made when it was known that there were only two companies competing. One was high and under pressure came down, but the other bidder got the order, anyway. It was finally explained that the president of the purchasing company had overruled price and ordered the business to be given to the other firm on "policy" for reasons that were unknown to his subordinates.

To the Manufacturer

INDUSTRY needs more sincerity in selling. It needs manufacturers who consider that a bid is a word given—an honest offer of service to a friend—and not just a gesture in a sparring match. In other words, a bid from a responsible concern to a reputable customer should be a firm bid, the pledge of the houses, signed with its good name. And such a bid is the equivalent of an open bid because there is no trick involved in it.

Firm bids preclude price cutting. They possess every advantage in competition. They maintain price levels by natural processes. They protect both the seller and the buyer by banishing the unseen menace of deceit.

The Moral Aspect

And there you are. Some men will say that it is natural, because men are different and act differently. It has always been so, they say. But is that a reason? There are many time-honored practices that some day will give way to the onward march of principle and be changed. There are many things that men used to do that have been stopped and are not countenanced today. After all, it gets down to a very simple consideration of plain honesty. If a purchasing agent lies or otherwise deceives a bidder into cutting his price, he is not dealing honestly. He is not fair. And if a manufacturer offers a bid that is not fair, either because the goods are not worth the money, or because he has padded the price for trading purposes, he is not dealing honestly. It is not square when you come right down to the plain facts. It is trickery. It is an effort to take advantage of the other fellow.

Everybody will agree that it is considered wrong to slip your hand into a man's coat pocket and extract his

wallet while his attention is distracted. No purchasing agent will do this to a salesman. No manufacturer will do it to a buyer. Well, the only difference is that dickering with bids and cutting prices has not yet lost its social standing. Today it involves no conspicuous degree of moral turpitude. But gradually it is going to be ostracized. The day will come when between intelligent business men price cutting will be taboo.

It is a matter of simple inescapable truth that destructive commercial warfare between competitors or between buyers and sellers eventually demoralizes markets, wrecks the economic health of the industry, and ultimately paralyzes the service upon which the public is dependent. That is the reason why we find modern business bulwarked about with codes and standards and principles, with a highly developed system of self-imposed controls that have evolved out of experience because without co-operation and mutual good will there is no safety for investment, no stability upon which to base projects and plans.

This responsibility for safeguarding the economics of business is an obligation that cannot be forgotten very long even in the relationships between one larger buyer and his supplier. Profiteering purchasers and price-cutting sellers are forgetting this in an excess of zeal for sharp buying and for order snatching. But carried too far it brings its own defeat, for the manufacturer goes broke and the purchaser finds himself at last surrounded by enemies and he is lost.

Two Objectives

The greatest single problem in this whole situation to my mind is the difficulty of shaking men loose from the purely negative idea that because these unintelligent buying practices are general and have existed for long, they can't be changed. But that is just foolishness. Every buyer wants to get his money's worth. Every seller wants to get a fair price. No more, no less is satisfactory. What can be done, therefore, to put an end to the haggling and the price cutting? Fundamentally it seems to me there are two things to be done—

One—*By the purchaser*—Industry needs more intelligent buying. It needs purchasing agents who know the values of the equipment they buy, and make of their function something more than an adroit matching of prices. It needs frank open recognition of the fact that what is bought must be paid for and that bids which embrace elements of engineering, and of service as well as the delivered product, cannot be compared by a mere tallying of the total cost figures.

Therefore, the time must come—will come—when the purchasing agent no longer shall be rated for his penny-squeezing ability, but for his engineering skill in sensing and securing the greatest values for the money spent. And one of his greatest resources will be the good will and support of his suppliers.

And Two—*By the manufacturer*—Industry needs more sincerity in selling. It needs manufacturers who consider that a bid is a word given—an honest offer of service to a friend—and not just a gesture in a sparring match. In other words, a bid from a responsible concern to a reputable customer should be a firm bid, the pledge of the houses, signed with its good name. And such a bid is the equivalent of an open bid because there is no trick in it. It is not subject to a revision, any more than the written word of that manufacturer is subject to question, because his honor is involved.

Firm bids preclude price cutting. They possess every advantage in competition. They maintain price levels by natural processes. They protect both the seller and the buyer by banishing the unseen menace of deceit.

All this will not happen at once—not this week. I know it. But industry can work toward it—can fight for it. And the logical approach to it is for the seller to refuse longer to cut his price because the buyer tells him to. Let him at least begin to protect himself by making sure that the other bids that he is asked to beat are comparable and that the purchasing agent is not lying. If he is asked to refigure after the bids are in let him at least demand that all the bids be opened to inspection. And also, it is time the manufacturer knew a little more about the reasons why he loses orders, through regularly organized post mortem studies of the bids on his closed business.

The days of haggling and bickering are all done in retail trade. Some day price cutting will pass out of industry. And men will wonder why it was that we could have been so long blind to economic truth.

Why Not Use Hydraulic Drive for Planers?—*Discussion*

By C. M. Conradson

REFERRING to the article by E. I. McGee, under the title given above, published on page 292, Vol. 68, of the *American Machinist*, while in no sense, posing as an authority, I state unreservedly that such machines are practicable; that all the conditions covering their design are thorougly understood; and that it would be possible to design such a machine, build it and have it running in a few months. I would look for no "experimentation," a word much used to cover ignorance or carelessness in design.

Such a machine would be more efficient than the best planer now running, in that it would do more and better work, would be easier and quicker to handle, the repairs would be trifling and it would be vastly more durable. It would be more efficient in the use of power and would be much cheaper to build than the up-to-date electrically-driven planer of today. It would permit of very slow speeds for using forming tools and, in my opinion, it would be entirely practicable to form the entire top of a lathe bed with a built-up forming tool. For such work, the hydraulic drive is particularly well adapted because the bugbear of tooth marks would be absent. Needless to say the controls would be hydraulic and this would permit of great improvements over present designs.

In the summer of 1896, I attached a hydraulic cylinder and piston to an existing planer and operated it for some time—long enough to prove the entire practicability of such a machine. In this machine a differential piston was used in connection with a constant delivery pump, the rapid return being in the ratio of the effective areas. A valve was used to secure the reciprocating motion of the platen. In 1915, I attached a hydraulic cylinder and piston to an existing shaping machine. In this case a variable delivery pump was used, the crankpin of which was shifted by means of an auxiliar cylinder and piston, the travel being regulated by adjustable nuts. A valve controlled by tappets actuated the piston. This was, undoubtedly, the first time a planing machine was actuated by a variable delivery pump.

In the same year, I designed and built a 28-in. shaping machine hydraulically actuated. In this machine a direct-driven variable-delivery pump was used, a timing device tripping a cam for varying the delivery of the pump. This machine was wholly successful and would take exceedingly heavy cuts as well as very light ones. It was set to cut 0.0005-in. deep with 0.001-in. feed and worked so steadily that the chips never broke. This stunt was continued for several days to prove the smoothness of action.

Erecting-Shop Tools in Use at Paducah

By Frank W. Curtis
Western Editor, American Machinist

A group of tools and devices for the erecting shop that makes possible a reduction in the time required in performing many of the more important operations

SOME of the tools utilized in the erecting department of the Paducah, Ky., shops of the Illinois Central System are here illustrated, among them being the portable cylinder-boring device shown in Fig. 1. It employs a boring bar, mounted on the cylinder in the usual manner, and a 7½-hp. electric motor is used for the drive. The truck on which the motor is mounted has a pipe frame that supports the starting switch and a rheostat. When the motor has been aligned properly, blocks are placed under the rear wheels to keep the truck from shifting out of place. Three units of similar construction are available for handling this class of work.

The fit between the cylinder and the head is made steamtight by grinding. A compound consisting of fine abrasive and oil is applied to the joint as the head is oscillated under spring pressure. The air-operated device that drives the head is shown set up at the front end of a cylinder in Fig. 2. The air motor is of the vertical, single-cylinder, double-acting type, having a flywheel to which a connecting arm is attached. The arm in turn is connected to a wooden crossmember attached to the cylinder head, so that rotary motion of the flywheel causes an oscillating motion of the head, enabling a joint to be ground in less than an hour. Little attention is required, however, once the unit is in operation. Grinding pressure is obtained through a helical spring passing through the cylinder and supported by a plate at the rear end. Valve setting is accomplished by moving the locomotive in either direction by the portable electrically-operated winch, illustrated in Fig. 3. The base of the winch is made of heavy boiler plate on which the necessary gearing, a cable sheave and a 25-hp. motor are mounted. A lifting hook supported by three tierods is attached to the unit, enabling it to be picked up by an overhead crane and transported to the location desired.

Two clamping lugs positioned at the inner end of each pit are used to fasten the winch in place. The lugs correspond with eyes attached to the baseplate so that it is necessary only to place the unit in the correct location and then insert two pins through the lugs and eyes. A 40-ft. cable is attached to the operating switch of the motor, so that the unit can be controlled by an attendant standing on either side of the engine, close to the valve mechanism. The cable is connected to the front end of the engine when forward motion is desired, and is connected to the rear end and around a pulley at the opposite end of the pit, when reverse motion is necessary.

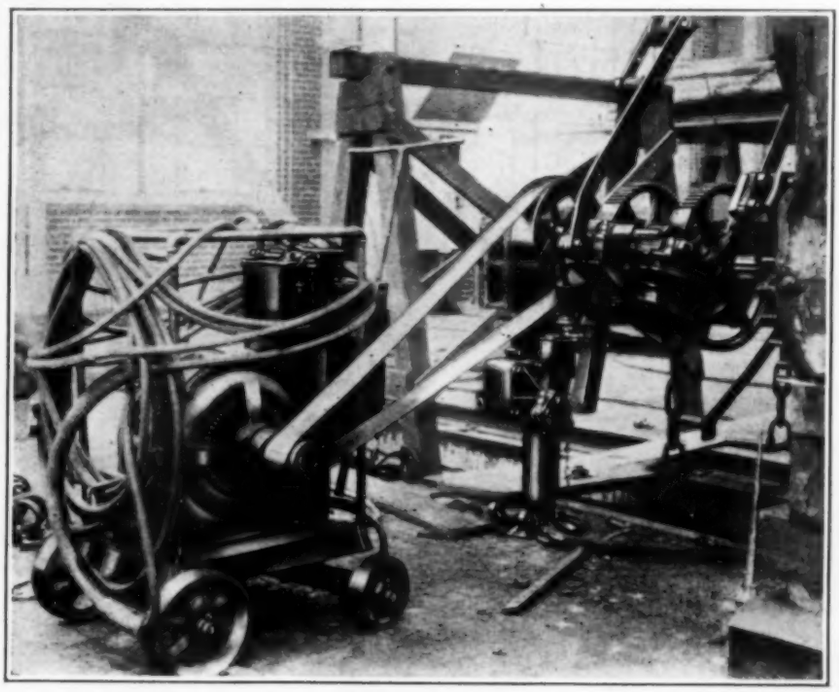


Fig. 1—A standard type of cylinder boring bar driven by a 7½-hp. portable electric-motor mounted on a truck. The wheels of the truck are blocked to prevent the truck from shifting. The drive is by belt through gears

Driving wheels, mounted on their axles, are transported between the locomotive shop and the roundhouse on a truck such as illustrated in Fig. 4. The truck is equipped with a hydraulic jack for lifting the load, thus avoiding the necessity of using a crane. In use, the truck is run between the wheels and the load is raised until the wheels clear the floor by approximately 2 in. Rubber-tired wheels are used in order to prevent the heavy load from crushing the floor or cracking the con-

The sixth article of seven. The seventh will appear in an early issue.

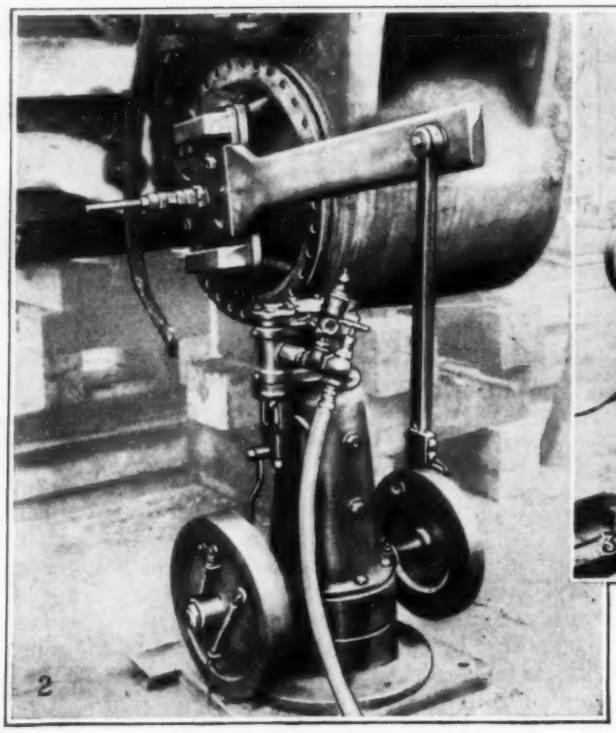


Fig. 2—Grinding-in a cylinder by means of double-acting air-operated motor requires from 30 to 60 min. To make the joint steam-tight depends upon the condition of the parts. Grinding pressure is obtained by a helical spring that passes through the cylinder and is attached to a plate at the opposite end

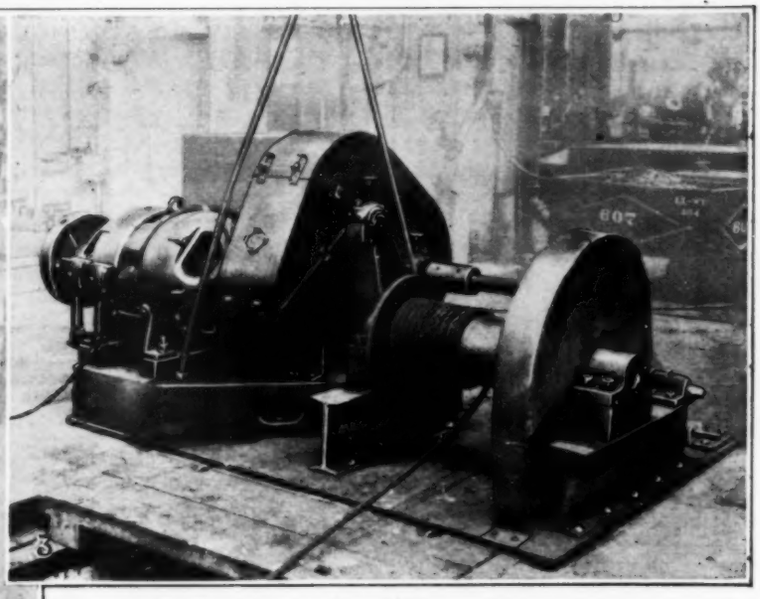
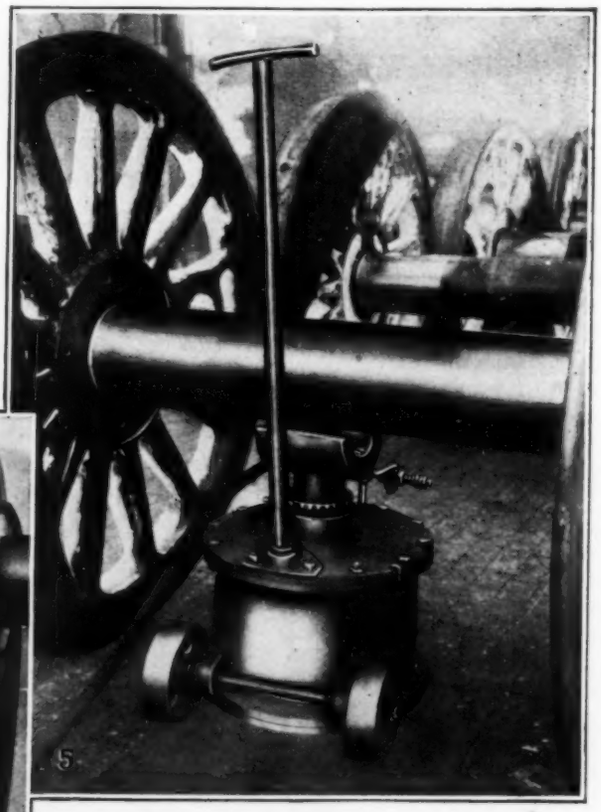


Fig. 3—This portable electric-winch is used for moving locomotives for setting the valves, and is locked by pins that pass through eyes in the base into lugs set in the floor. The switch is conveniently placed, so that the motor can be started or stopped by the operator when standing close to the valve mechanism

Fig. 4—Several trucks equipped with hydraulic jacks are used to transport driving wheels, mounted on their axles, through the shop. The trucks are mounted on rubber-tired wheels, so that the heavy loads will not mar the floor, or break the concrete roadways



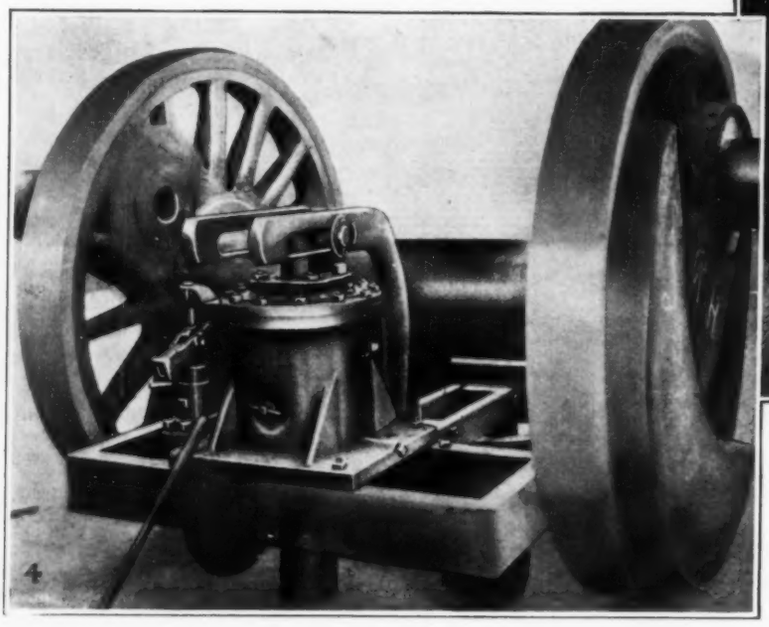


Fig. 5—In applying Christman hub plates to driving wheels, the wheels are raised from the floor by this air-operated jack, enabling them to be rotated for drilling the holes. A curved swivel plate attached to the ram fits under the axle and holds it in place as the wheels are rotated

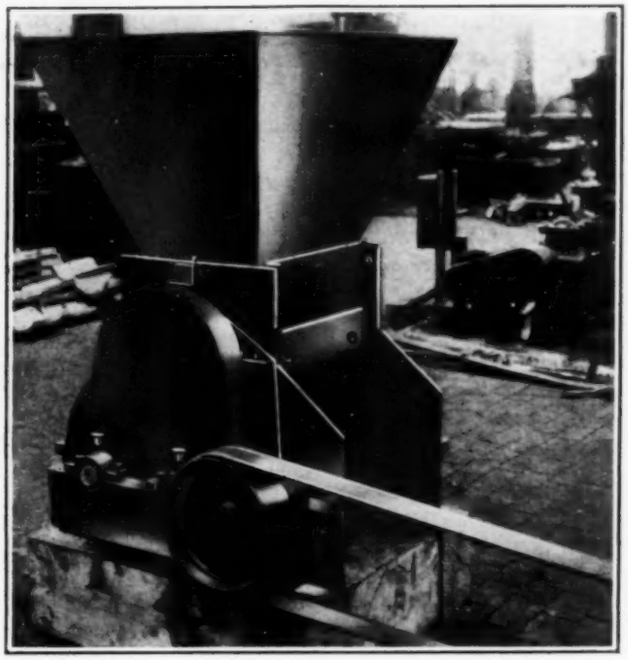


Fig. 6—Pieces of old asbestos are ground between drums equipped with teeth in this machine. The ground material is made into asbestos mortar for insulating boilers in places where sheet asbestos cannot be applied

crete roadways in the yard. The portable compressed-air jack shown in Fig. 5 is used to raise the driving wheels so that they can be rotated for convenience in drilling holes for applying Christman hub plates that are now being placed on all the larger types of engines.

A labor-saving device that cuts hours to minutes is the asbestos grinder, or crusher, illustrated in Fig. 6. It is for crushing asbestos to be used in a plastic state for boiler insulation in places where asbestos blocks cannot be applied. Old asbestos is placed in the hopper and passes between two revolving cast-iron drums having teeth set in a helical path. The device is placed over a mixing pan so that the ground asbestos can be made into lagging mortar as soon as it passes out of the delivery spout at the side.

Johnson Gets a New Slant on Guaranties

By John R. Godfrey

ONE of my friends who has developed a good high-production machine in a small way, has also developed a lot of horse sense about selling it. He was in Johnson's office the other day when I was there, and the old man tried to josh him about the new machines.

"Suppose you'll guarantee most anything if you get the order. Put it in for three months and take it out if it don't make good, eh?"

"Not on your life, Mr. Johnson. I wouldn't even do that here, where I know it's a good shop and know that you're a square shooter."

"Other folks do, Buxton, why not you?"

"For three reasons: First, I think it's poor business and next I haven't the capital to tie up. Lastly, I'm not a gambler—and that's the worst kind of a gamble."

"As how, Buxton—I get the second point all right. I'm not so sure about the first and I'm plumb loco about the gamble point. Just what do you guarantee, anyhow?"

"Production per hour or per day, primarily. But not in your shop, Mr. Johnson—in mine."

"That's a new one—what ails my shop?"

"Nothing, I hope—but that's where the gamble comes in. I'll build you a machine and guarantee so many pieces an hour, with *your* men but in *my* shop. You send your men and we'll teach them to run the machine. If they don't get the guaranteed production—the deal is off—it's my machine, not yours."

"But won't it do the same in my shop as in yours?"

"It will if it's handled right and not neglected or abused. That's the part I can't guarantee. That's the gamble I spoke of.

"Every machine is well run-in and tested on your work before it's shipped. Your own men run it and know it's O.K. It gets to your shop and someone forgets to oil it, or doesn't strain the oil and the oil pipes get clogged so a bearing heats up, seizes and scores. Or someone drops a wrench into the gears and gums up the works.

"What happens, Mr. Johnson? You send a wire for a service man—get him out of bed, maybe. He travels perhaps a thousand miles, spends two days getting it in shape again, and gets cussed because the machine is out of production. And it isn't our fault at all. That's why our guarantee ends at our shop door."

"But suppose it is the fault of the machine, Buxton? Suppose a hidden flaw in a forging lets go, wouldn't you make good on it? And don't you have any service men?"

"Yes to both questions. We'll always make good when it's our fault. And we have a dandy service man who'll help out any time—at *your* expense, unless it's a flaw in that forging you mentioned. Any time he is in this locality he'll probably drop in and see how things are going. Perhaps he'll have some new ideas for you."

"But you won't guarantee production in my shop?"

"No, sir. When we teach your men and get the production specified, in *our* shop, we're through with production guaranties. It's up to you to get production after the machine is in your shop. You know you can get it unless the men fall down on the job or you use poorer tools, or harder materials. We're not playing wet-nurse to any machine that we know is O.K.

"If you want our man to break in some more men or jack up production, he'll do it, of course, and you'll get a bill for his time. Why? Because he's helping you earn more dividends. We've already made all we can from the machine."

"Don't buyers balk at your stiff-necked policy, Buxton?"

"Sure thing, Mr. Johnson. A lot of 'em hit the ceiling and never come down. But we are just as fussy to whom we sell as they are about buying. It costs money to put a machine into the wrong shop. Unless the men are friendly to our machine, we had rather it wouldn't go in. For even though you know it can make good, because you saw it work O.K. on our floor, you get the notion we hypnotized you or something. Most shops take the word of their own men above all else—and sometimes won't even investigate to see where the trouble is. So we try to be careful in picking customers, especially in a new locality. We want our first machines in any given district to get a fair show."

After Buxton had gone Johnson said, "That young man will either go broke soon or he'll make a howling success. I like his nerve and I hope he wins out."

· THE · FOREMAN'S · ROUND · TABLE ·

The following narrative is a "case" presentation of the topic. It has been written to involve some of the questions that arise in the average shop. For guidance in preparing discussion the questions at the foot of the page have been prepared

He Never Asks for a Raise

"YOU look sort of peeved, Ed, what's the matter?" Al was speaking to Ed, as they walked away from the shop one winter night.

"You guessed right, Al. I am peeved, just can't figure out what sort of a chap Bill Hankins is, anyhow. Quit me cold. Didn't even ask for a raise, just gave two weeks' notice and that's that."

"Wasn't he one of your best men, Ed?"

"You bet he was, Al. That's what makes me sore. I'd have asked Williams to boost his pay if I'd had any idea he thought of leaving."

"Suppose you asked him why he was quitting, Ed."

"I sure did, and I didn't wait long, either."

"And what did he say?"

"Why, darn it, Al, that's what peeves me most. Just said he knew he was worth more money, and as long as I didn't give it to him, he found a job where he'd get it.

"Of course I asked him why he didn't tell me he wasn't satisfied and ask for more money."

"What was his alibi, Ed?"

"Told me he never asked for more money anywhere. Said he figured that if the boss thought he was worth more he'd give it to him without asking. If he didn't, he concluded the boss didn't appreciate him, and so he hunted another job and then went to it. Now what do you know about that, Al? Wouldn't you be peeved, too?"

"I expect I would, Ed, and yet I admire the chap just the same. You can't say he didn't play fair, as he gives a good notice. Sort of puts it up to us to watch a really good man and beat him to it—eh, Ed?"

"How was I to know he wasn't satisfied, Al? He was a good worker and never grouched. I'm no mind reader, and you know most men don't hesitate to ask for a raise. Wonder what Williams will say?"

Should Bill Hankins have asked for a raise before taking another job? Can a foreman sound out a man to find if he is satisfied without suggesting a raise in his mind—and how? Should raises be given voluntarily?

All foremen are urged to discuss these questions vital to their work; of course the

discussion is not limited to foremen. Letters accepted and published will be paid for

Discussion of Earlier Topics

Paternalism or Privacy?

FROM the standpoint of industry, any expedient that facilitates the production of goods is justified. Interest in the employees and provision for their comfort tends to make the workers more efficient, but too much interest may cause resentment on the part of some. No man will reasonably object to the firm's supplying washing facilities, including soap and towels; nor will he object to the provision of a plant physician and rest room. Yet a man does not care to have the firm supply his amusement or give him pecuniary advice. These things pertain more to his life as a person or member of a family.

Some industries feel that each employee is a buyer of goods as well as a worker. If provision for comfort at the plant helps a man to be a better member of society, then his own firm is indirectly benefited. Industry as a whole ultimately is affected by the relation of the man to the firm. —ERNEST SIMONSEN.

Shall It Be Layoffs or Short Time?

THIS is a very important matter, and should be given a great deal of consideration. Most shops that have been running full time for a considerable period, even though they have efficient foremen, will possibly have collected some undesirable help, and in the case of slowing up I think that this class should be weeded out. Then, after the man power of a shop has been brought to a standard, the time can be cut if necessary. Under no consideration would I put this question up to the men to decide, for they are never satisfied with the result, especially if the vote is near even. I believe in the management using good judgment and doing what it believes best for all concerned.

—R. Q. TARBUTTON, *Foreman.*

Discovering Hidden Ability in the Men

THERE are many men capable of shouldering responsibility who are undiscovered just because management takes no step to uncover them. No matter what plausibly sounding excuses are offered, the management that doesn't find an opportunity over a reasonable period of time to discover what its men are made of outside of their immediate jobs, may deserve the title of "supervision," but it has lost its right to that of "management." And how amazed this same management is when another concern takes one of its "cogs" and makes a successful leader out of him!

THE·NEXT·TOPIC

Training the Foremen in Management

ADVANCE QUESTION

The company is going to considerable expense to give the foremen a course on management problems. But Ed balks on compulsory classes. Al thinks it a necessary part of the foreman's job. What do you think?

Discovering the potential possibilities of the men is really a matter of mental attitude toward him. If the desire is there, there are countless opportunities presenting themselves to give the man in question a little job out of the ordinary, and let him know that you are placing your confidence in him to put it over. Once you give it to him, let him have it whole heartedly, and permit him to see it through, even though you may have to start another man at it without his knowledge to cover the job if he fails. There are many ways of arriving at a given destination, and a hopeless-looking start may often lead to a brilliant finish. When the man has demonstrated that he is thoroughly master of himself, then you can feel confident that he is a good prospect to lead others. Then, and only then, should he be tried out in leading others. —HARRY PLANT.

Should the Super Talk to the Men?

THERE is one bad feature in the idea of the super talking to the men. It is simply beyond the average human nature to avoid getting all puffed up about this attention. As a consequence it makes the men difficult for the foremen to handle, and they feel that if they get a call-down they can tell their side of the story to the superintendent in what they imagine would be a clever roundabout way. Even if the super sustains the foremen, the damage is done, for it is in the entertaining of this thought and the resultant mental attitude that the real danger lies.

There is also the danger that the super may unwittingly make some comment relative to the way the work is to be done. This may put the foreman in an embarrassing position to have the machinist correct him, quoting the super as his authority.

The proper way is for the super to make it his duty to seek contacts with the men outside of the shop. This may be accomplished by taking an active part in factory social activities such as the company picnic or athletic games. He may also achieve this end through community activities in which the men all participate. In this way they will regard him as a good fellow without carrying the familiarity into the shop. —JAMES P. CONNOR.

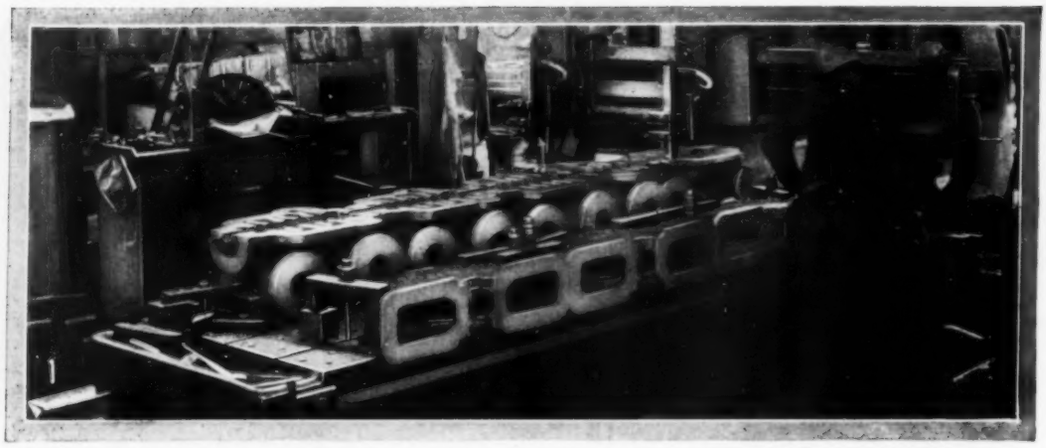


Fig. 1—Planing two jobs at once. On the far side of the planer are the lower halves of five multi-stage pumps, while beside them are the tops of turbine cases, all being planed at the same setting. Both heads on the planer rail and the side head are utilized

How Centrifugal Pumps Are Machined

Photographs by courtesy of the Dean-Hill Pump Company

Fig. 2—Boring the diffuser spaces in a multi-stage pump. The top half has been removed to show the construction of the boring bar. The cutter is fed into the work by a handwheel at the end of the bar, which is hollow and has screws and gears for feeding the cutter in or out. Locknuts are provided for stopping the cutter when the proper diameter has been reached

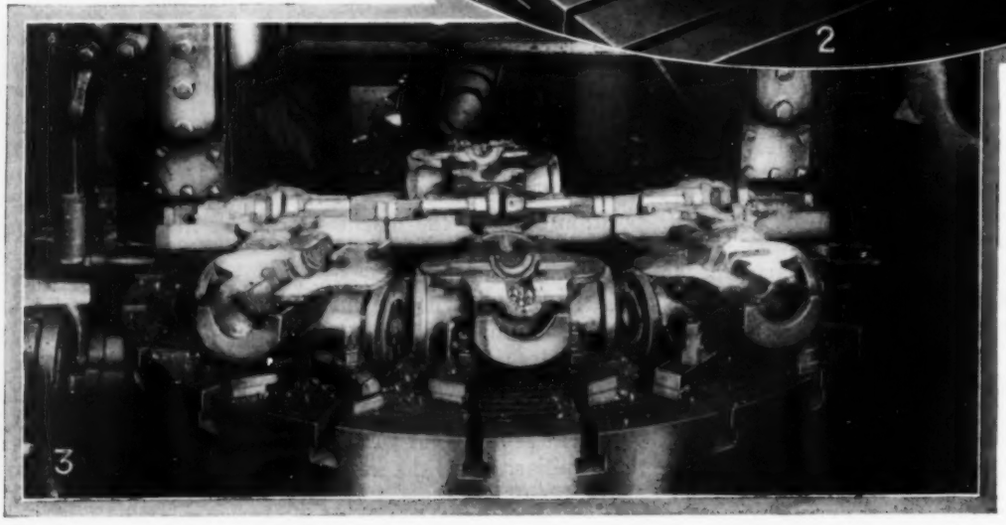


Fig. 3—Facing the gasket flanges on seven small centrifugal pumps at one setting. The castings are held on the boring mill table by means of simple straps and clamps that enable them to be quickly located and held in place for the facing operation. Cuts are made by each toolhead, so that a roughing and finishing cuts are taken at the same time

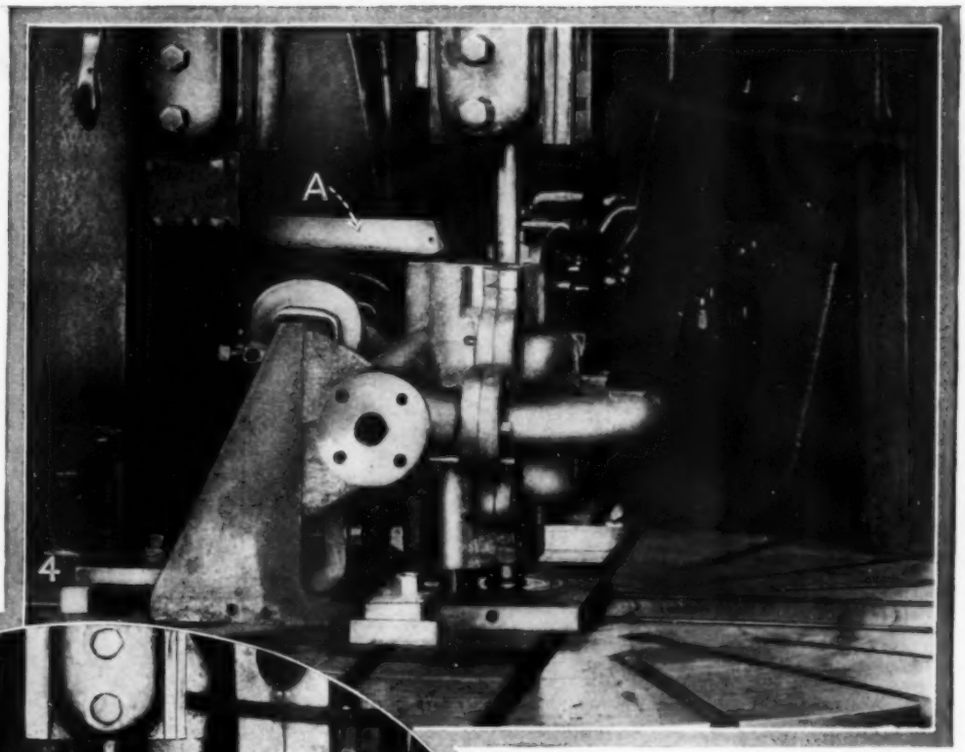


Fig. 4—Boring pump casings. The casing is held against an angle plate having an extension that carries a guide for the lower end of the boring bar. By using the extension toolholder shown at *A*, the upper end of the casing is faced while the hole is being bored

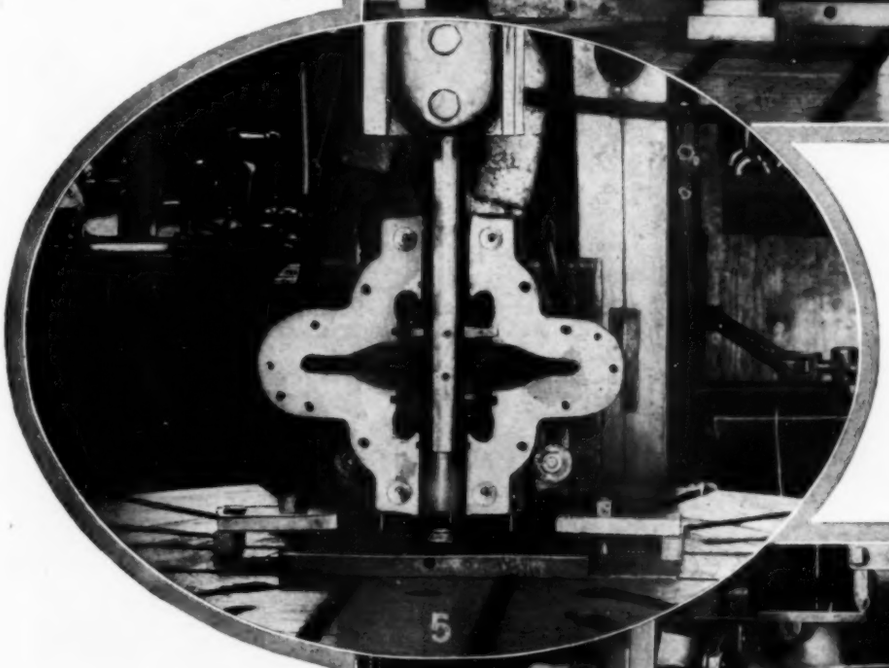


Fig. 5—Cutting the wearing-ring grooves. The bar is enough smaller than the hole to permit cutting the grooves by side movement. It is put in place, the side opposite the cutting point bearing against one side of the hole. The top half of the casting is put on and the cutter is fed into the work until the bar strikes the opposite side of the hole

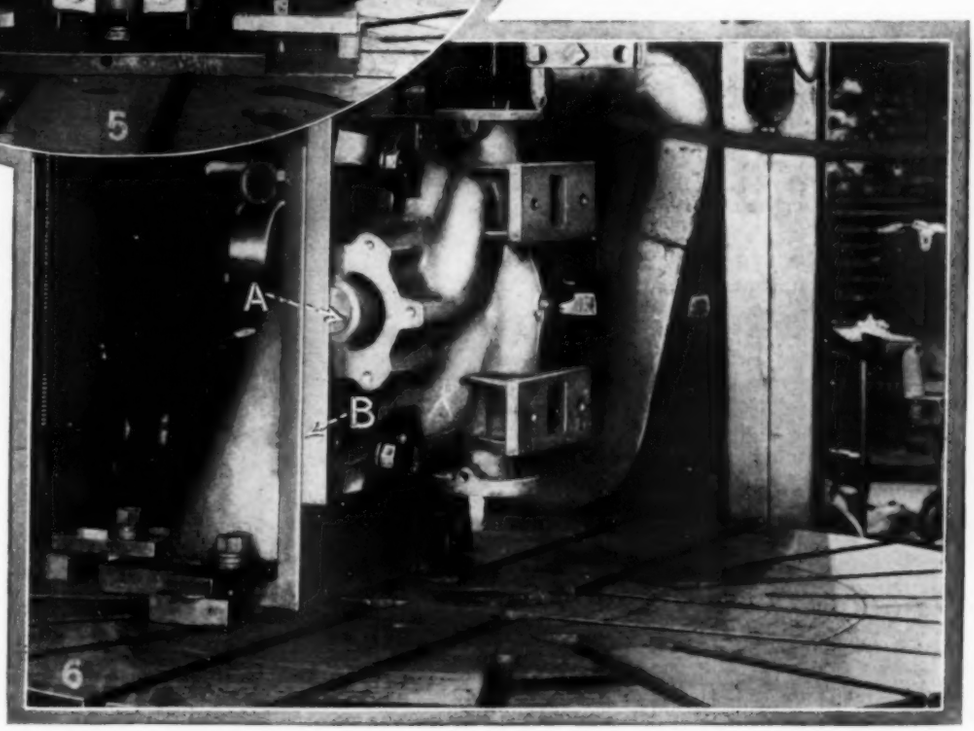
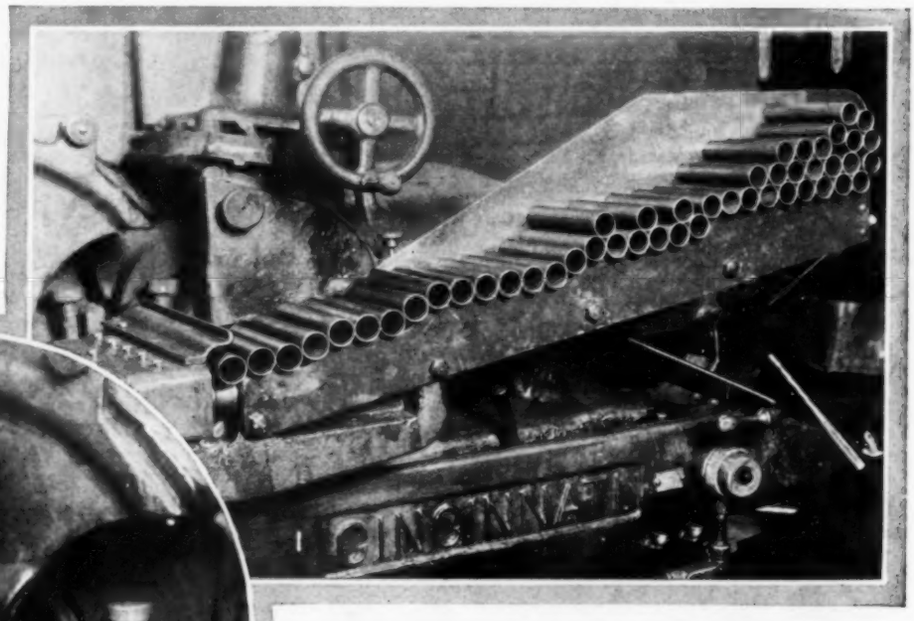


Fig. 6—Facing the pipe-opening flanges. The casing is located by the shaft bores by fitting a corresponding piece, *A*, on the rotating plate *B*. After facing one end, the plate is turned half-way around and the opposite flange is faced

Special Mass-Production Machines

From a paper presented by H. L. Blood of the Western Electric Company, at the Chicago Machine Shop Practice Session of the A.S.M.E., March 14, 1928

Fig. 1—An ingenious device for feeding steel tubes into a centerless grinder. Tubes are stacked in an inclined rack having a series of steps that keep the tubes parallel as they roll down the incline. The tubes are fed endwise, one at a time, by grooved rollers driven by one of the shafts of the grinder. Since the weight of the tubes is not sufficient to provide the traction necessary for feeding, the rollers are magnetized through their studs



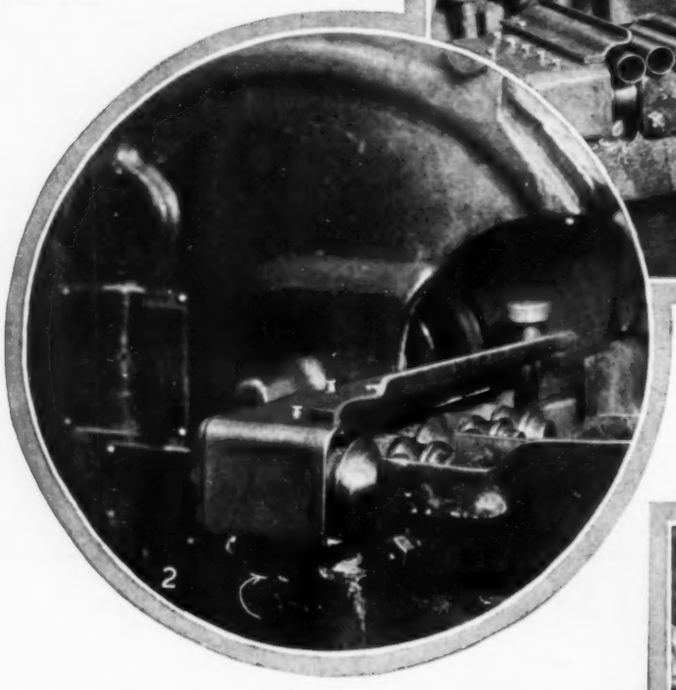
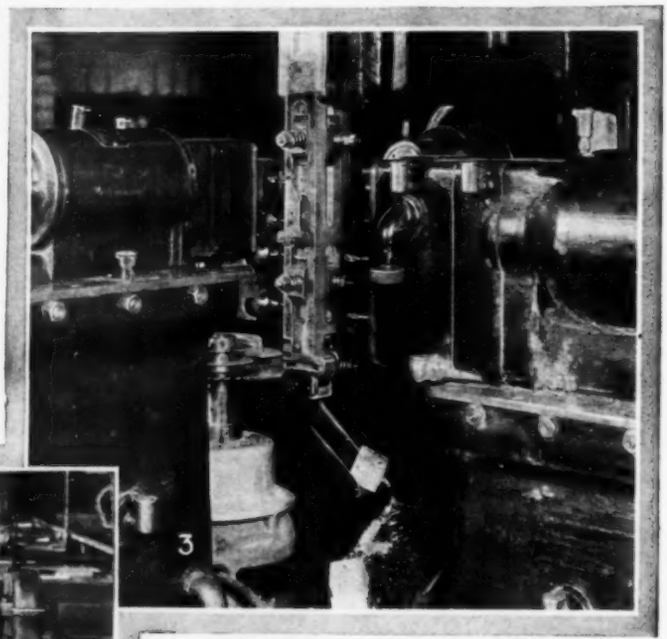


Fig. 2—A close-up view of the rollers. The frame supporting the studs is made of bronze and the studs are connected at the end opposite the rollers by a bar of soft steel. The studs are magnetized so that adjacent rollers are of different polarity. When a tube makes contact with two adjacent rollers, the magnetic circuit is completed and traction is secured

Fig. 3—A machine that makes wooden spool-heads from blocks containing a number of holes. Four drill heads, each of which is driven by a built-in motor are fed from four sides by cams. During the drilling operation a saw at the bottom, driven by an individual motor, cuts off a spool-head



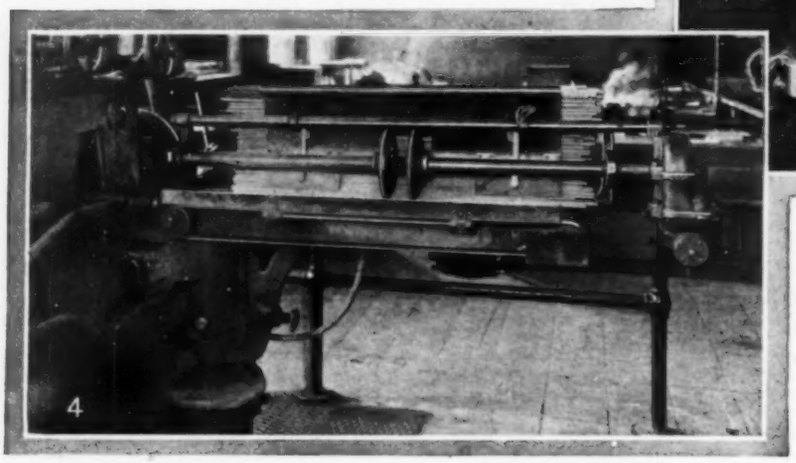


Fig. 4—An attachment for feeding hard rubber tubes into a centerless grinder. The tubes are laid in a V-shaped hopper, at the bottom of which are two rubber-tired disks that revolve slowly and roll the tubes against one side of a frame, dropping them one at a time on a moving belt. The belt carries the tubes into a nozzle. Inside the nozzle streams of water impinge upon the tubes at an angle and carry them into the machine

Details of Jigs and Fixtures

Design of Shackles

By J. A. Potter

Shackles are combinations to accomplish multiple clamping or other operations with one hand movement—Points of design and action

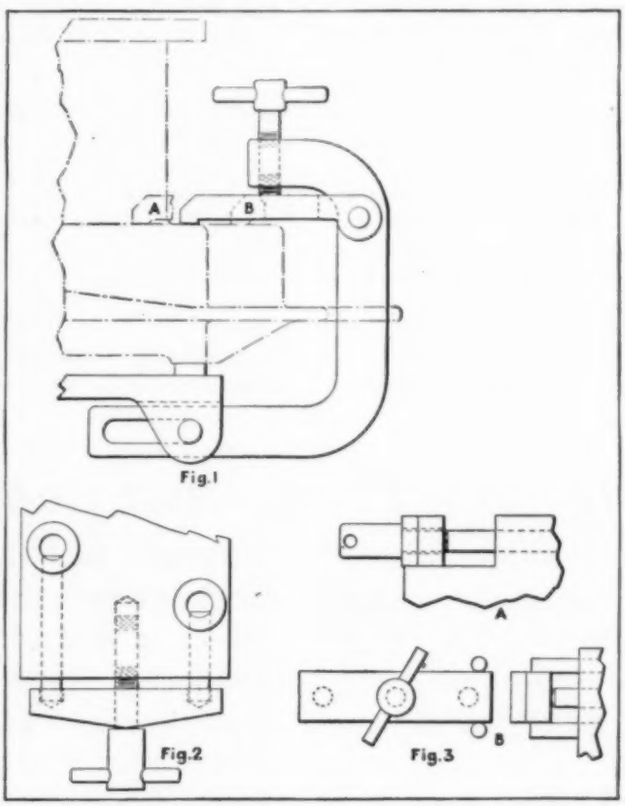
A SHACKLE may be defined as a link connection to allow certain parts only a limited movement. In tool work a shackle is usually considered as a part that will operate more than one clamp, shaft, spring pin, or equalizer through a single tightening operation. This may be accomplished by a straight-line movement, rocking action, parallel motion or by the use of cams, but in all cases there should be considerable freedom in action.

Particular care should be taken in the layout of shackle combinations to make certain that they will function as intended, and not jam. If links, bell cranks and levers are to be used, the combination must not be made bulky. Care must also be taken that they do not pass beyond the centers, or overthrow, when they are tightened.

A type of shackle known as the "C clamp" is shown in Fig. 1. This type can be used to advantage on parts where a flange must be cleared, and where a long clamp would be required if used directly on the part. This shackle can also be moved out longitudinally through the slot to allow the part to be pulled forward or backward when unloading or loading in the fixture. The point of contact is directly over the pin upon which the shackle swings, although the screw is placed back of the toe on the clamp in order to clear an overhang of the part. If the toe should be placed at the positions *A* and *B*, the shackle would overthrow, or slip, on the work. Two spring pins can be locked by the use of a shackle as illustrated in Fig. 2. This consists of a clamp with equal legs bearing on two hardened pins which lock the spring pin. The end of each leg is counterbored large enough to give freedom to the locking pin, and the back of the shackle is rounded so that it will rock. Where it is necessary that the binding pins should extend out beyond the bosses for any distance, it is better to locate the shackle on a shelf, or have one of the legs located between pins as shown in Fig. 3, at *A* and *B*, respectively. This will prevent the shearing of the binding pins when tightening the hand screw.

A shackle that will bind two pins widely separated is shown in Fig. 4. In this case a long bar passes through the jig with clearance holes through which the spring pins also pass. One end of the bar has a binding screw, and the other end has a binding pin backed up by two headless screws, one of which is for adjusting the rear spring pin, and the other for locking. In action, the binding screw locks the front spring pin, and the bar being free to slide in the hole binds the rear spring pin with the hardened binding pin. As this combination is rather bulky and heavy, it is recommended only for the larger jigs and fixtures.

The double equalizer illustrated in Fig. 5 and used particularly for vise jaws, is another form of shackle. This equalizer can also be applied to jigs and fixtures, and may be found useful in holding two or more parts of unequal size. The arrangement shown in Fig. 6 shows two sliding clamps of the hook-bolt type held in place by slots and pins, and operated by a screw in the shackle. There is much freedom of operation with this type, and a fixture thus equipped will hold a number of parts having considerable variation in thickness, provided that the lengths do not vary. The parts may vary as shown in *A*, and a small part may have an elongated hole, as shown. This arrangement allows the cutter in the spindle of the machine to be brought up close to the work for spline milling the hole. A spacing block or a latch can be used under the binding screw to allow the clamps to open quickly. A shackle can be used to operate two clamps, as



Figs. 1-3—The adaptation of the shackle principle to clamps

The twelfth article. The thirteenth will appear in an early issue.

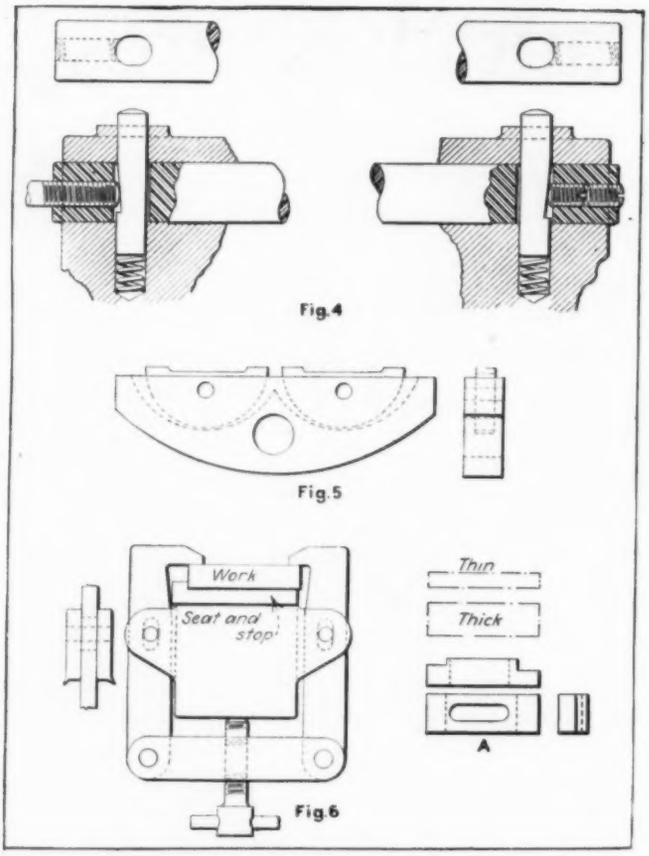
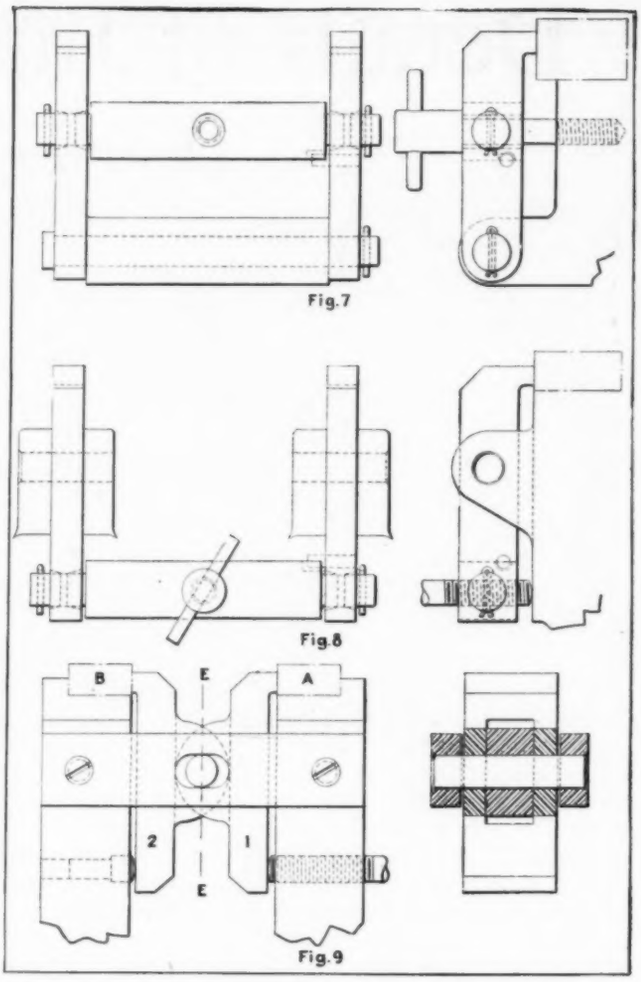


Fig. 4—A shackle for binding spring pins in a large fixture. Fig. 5—A shackle with swivel clamps. Fig. 6—A double acting clamp



Figs. 7-8—Multiple type shackles for operation with one binding screw. Fig. 9—Multiple clamp operated by one screw

shown in Fig. 7. This drawing shows two clamps hinged by a pin on the tail end, with a shackle pulling the clamps, so that the toes will bite the work. The shackle ends are turned down to pass through the holes in the clamps, which have been countersunk from each side. This arrangement permits the shackle to compensate for any difference in size of the two parts that it may be holding. In Fig. 8 the variation in design is shown with the clamps located on hinged pins at the center, and having the shackle lifting on the tail of the clamps instead of pulling. In both of these cases the shackle is doweled by a small pin to keep the binding screw in the operating position.

Two clamps on the same hinge pin with the pin free to move, as shown in Fig. 9, form a type of shackle valuable in small parts manufacture. If the binding screw is tightened, clamp 1 will force its toe against the part *A*, and then react through the hinge pin to clamp 2, which will settle against the pin on the tail end and bite the part *B* with its toe. An additional turn of the screw will bind both parts securely. This combination can be continued, based on the reaction principle, to hold also an uneven number of parts. From this description of different shackles many combinations can be worked out for use in jig fixtures in combination with latches and clamps, so that one movement of the hand will often accomplish the clamping results otherwise obtained by several motions.

Systematic Production Control

In a plant where upwards of 16,000 different parts are manufactured the problem of keeping production under control has a certain fascination. The leading article in next week's issue tells how it is done in a big Eastern shop. For instance, manufacture for parts stock is based upon weekly requirements as determined by past sales analyses. How the most economical manufacturing quantity is determined is also described. The work is done by a few clerks.

Table of Preferred Numbers

The accompanying table of preferred numbers was informally approved by the American Engineering Standards Committee and recommended to industry for a period of trial in practice.

Preferred numbers are the rounded geometric series with the ratios $\sqrt[5]{10}$ (5 series); $\sqrt[10]{10}$ (10 series); $\sqrt[20]{10}$ (20 series); $\sqrt[40]{10}$ (40 series). The exponents thus give the number of terms in one order of magnitude (that is between 1 and 10, 10 and 100, etc.).

In all length measurements, the numbers apply to the inch as the unit of length. With all other dimensions than lengths, the numbers apply to the unit forming the basis of the standardization, such as weight, capacity and the like.

Preferred numbers above 1 in. are formed by multiplying the numbers between 0.1 and 1.0 in. by 10, 100, etc. Preferred numbers below 0.001 in. are formed correspondingly by division of the numbers between 0.001 in. and 0.01 in. by 10, 100, etc. Between 0.001 and 0.01 in. the 20 series will probably serve as the finest gradation; the 40 series is therefore not given in this table.

So far as possible the numbers of the 5 series are to be used in preference to those of the 10 series, these again in preference to those of the 20 series, and these finally to those of the 40 series. It is permissible to pass over from one series of preferred numbers to an adjacent series.

.001 to .01				.01 to .1				.1 to 1.0			
5 Series	10 Series	20 Series	40 Series	5 Series	10 Series	20 Series	40 Series	5 Series	10 Series	20 Series	40 Series
.0010	.0010	.0010		.010	.010	.010	.010	.10	.10	.10	.10
							.0105				.105
		.0011				.011	.011			.11	.11
							.012				.12
	.0012	.0012				.0125	.0125		.125	.125	.125
							.013				.13
		.0014				.014	.014			.14	.14
							.015				.15
.0016	.0016	.0016		.016	.016	.016	.016	.16	.16	.16	.16
							.017				.17
		.0018				.018	.018			.18	.18
							.019				.19
	.0020	.0020			.020	.020	.020		.20	.20	.20
							.021				.21
		.0022				.022	.022			.22	.22
							.024				.24
.0025	.0025	.0025		.025	.025	.025	.025	.25	.25	.25	.25
							.026				.26
		.0028				.028	.028			.28	.28
							.030				.30
	.0030	.0030			.032	.032	.032		.32	.32	.32
							.034				.34
		.0035				.036	.036			.36	.36
							.038				.38
.0040	.0040	.0040		.040	.040	.040	.040	.40	.40	.40	.40
							.042				.42
		.0045				.045	.045			.45	.45
							.048				.48
	.0050	.0050			.050	.050	.050		.50	.50	.50
							.052				.52
		.0055				.056	.056			.56	.56
							.060				.60
.0060	.0060	.0060		.064	.064	.064	.064	.64	.64	.64	.64
							.068				.68
		.0070				.072	.072			.72	.72
							.075				.75
	.0080	.0080			.080	.080	.080		.80	.80	.80
							.085				.85
		.0090				.090	.090			.90	.90
							.095				.95
.0100	.0100	.0100		.100	.100	.100	.100	1.00	1.00	1.00	1.00

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IDEAS · FROM · PRACTICAL · MEN

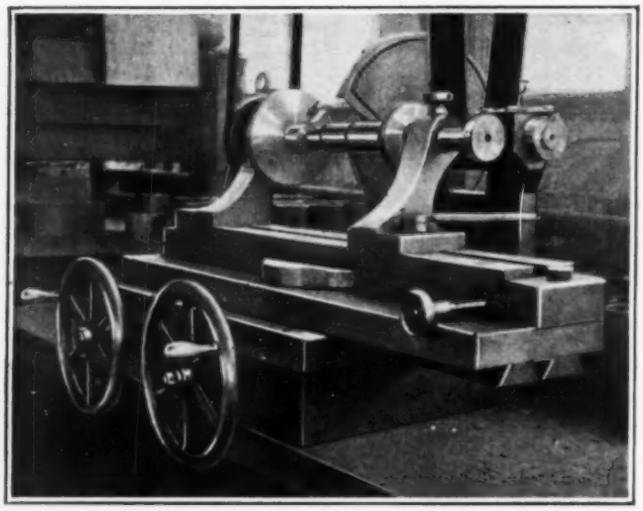
The department, "Ideas from Practical Men," is devoted to the exchange of information on methods useful to the machinery industries. Its scope includes all d... ... of the metal-working industry, from drafting room to shipping platform. Descriptions... have proved their value are... those published are paid for... mum of five dollars upwards, ...pending upon

A Home-Made Cylindrical Gri...er

By Frank Waldo

The cylindrical grinding machine illustrated is in use in a northern railroad shop that I recently visited. It is constructed of miscellaneous obsolete material, most of which was salvaged from old machines.

The wheel spindle is mounted in two bearings that are fitted to a frame attached to the machine base. The table, taken from an old milling-machine table, is fitted to the base and is operated longitudinally by the handwheel



A cylindrical grinder made from obsolete material

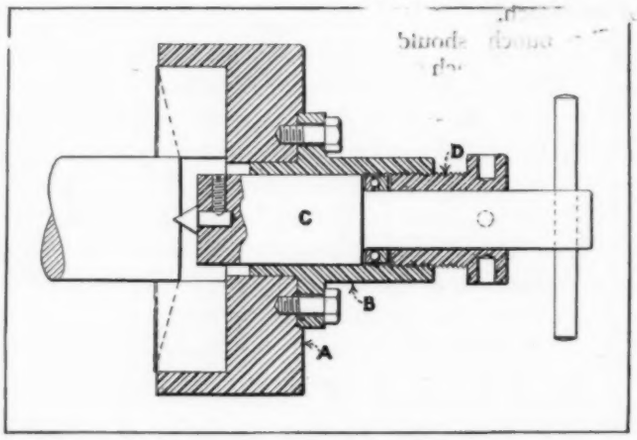
at the left. The other handwheel is used to operate the transverse feed. A sub-table is available to accommodate the grinding of tapered work. The machine is driven from overhead by two belts, one belt operating the wheel spindle, and the other belt the work spindle. Miscellaneous tools, pins and sleeves are ground in the machine.

Device for Centering Heavy Work

By J. T. Carroll
Manchester, England

The device shown in the illustration was designed to save time and labor in centering heavy work, or work that cannot be conveniently placed in the centering machine.

The device is centered on, and gripped to, the work by the universal chuck *A*, to which the cast-iron back plate *B* is fitted. The spindle *C* fits in the back plate and is revolved by the cross-handle at the outer end. The hole in the inner end of the spindle can be made



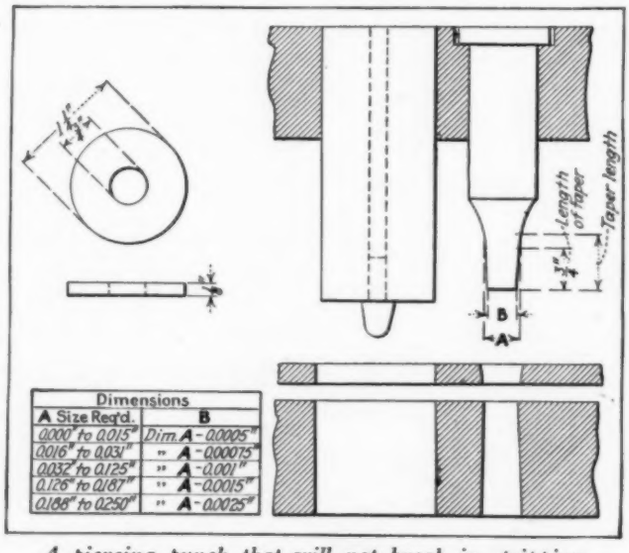
A portable centering device

to fit a drill or countersink of any size desired. The drill is fed to the work by turning the long nut *D*, a ball thrust-washer being provided to reduce the friction.

Why Piercing Punches Break

By Joseph Kountzman

The continual breaking of piercing punches has been a great annoyance to almost every toolmaker and toolroom foreman. Some of them place the fault on design, others on faulty hardening, while still others place it on the kind of steel used, such as oil or water hardening, or drill rod. I believe that in most cases of piercing punch breakages, the fault is with the stripping of the blank



A piercing punch that will not break in stripping

after being pierced. The punch in most cases breaks on its upward stroke, due to its being bound by the metal around it, holding very tightly, because the punch is straight instead of being slightly tapered. Incidentally, if the punch is not parallel with the die may cause considerable breakage.

breakage is to make the ...ration. It is made slightly ...ion required, the *A* dimen... this design, the punch tapers ...at required, to a dimension ...d, the full size being at three... of the taper, taken from the end

The ... be ground to size and highly polished. A punch made in this way will pierce the metal and will strip more easily than will one of any other form, and not break.

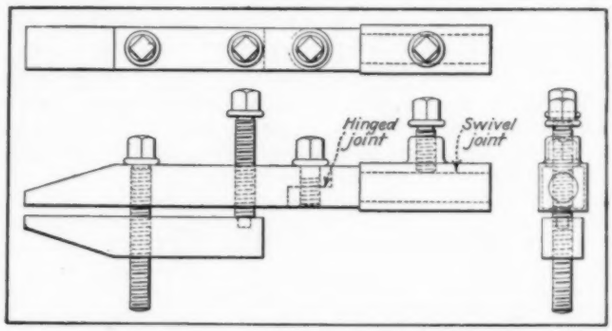
The table will give an idea of the general proportion of taper required according to the thickness of the stock used. The sketch shows the taper greatly exaggerated.

Toolmakers' Vise, or Clamp

By Ben West

In the accompanying illustration is shown a vise, or clamp, for holding work to be filed. It may be held in the ordinary bench vise or clamped to the bench itself, whichever is the more convenient.

By means of the swivel joint, the piece being filed may be rotated either backward or forward, thus enabling



Handy vise, or clamp, for the toolmaker

the workman to note the progress of his work without removing the piece from the clamp. The hinged joint allows the work to be brought into a position where the light will fall upon it to the best advantage.

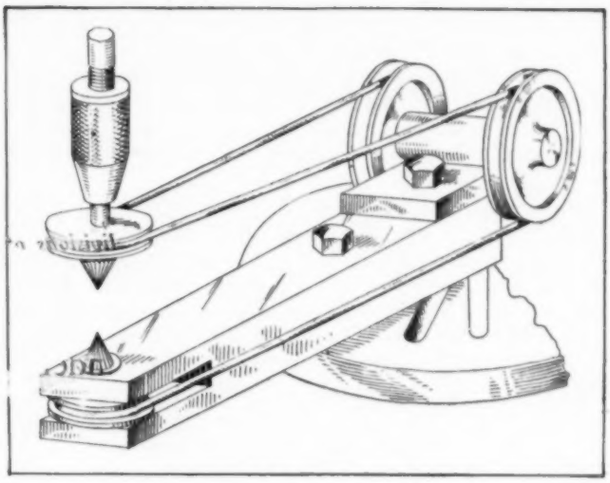
A Special Countersinking Attachment

By S. Lomas

Manchester, England

We had a contract to make a large quantity of bronze bushings in which each bushing had sixteen oil holes drilled through the body. The specifications called for the oil holes to be countersunk on both the inside and the outside.

Not having any tool by which the countersinking could be done, we built the attachment shown in the illustration, which was used in a drill press. Grooved pulleys were attached to the shanks of both countersinks and were connected by a belt of cotton rope running around



Attachment for countersinking

two idler pulleys at the rear. The end carrying the lower countersink is, of course, small enough to enter the bushings.

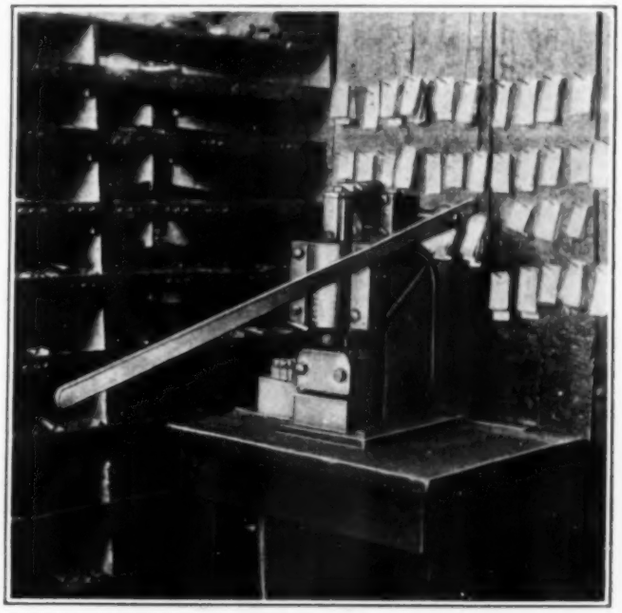
The time for countersinking the sixteen holes in each bushing was about one minute. The attachment is so simple that its operation can readily be understood without further explanation.

Tagging Locomotive Parts

By Frank C. Hudson

After a locomotive has been stripped it is not always easy to keep the various parts together, or to have them so identified that the link block, for instance, of one locomotive and the radius arm of another will not drift together for assembly. For, though this might have made little difference when both locomotives were new, it is almost sure to add to the work necessary in fitting them up after they have seen service between shoppings.

The Colonie shops of the Delaware & Hudson Company tag all parts very carefully with metal tags bearing



Press for making tags of tin to be wired on locomotive parts

the number of the locomotive to which they belong. The tagging is done at very little cost by using strips of sheet tin for the tags and stamping them in the little press shown herewith. Ordinary steel stencils with ⅜ or ½-in. letters are used, being easily assembled, or set, in the head of the press. A copper plate below the strip acts as the matrix.

The press ram has a stiff coil spring that forces it down after the ram has been lifted far enough to trip the latch, thus giving a uniform blow and making a tag that is readily legible. The hole at the end of the tag, for wiring it to the part, is also punched at the same time.

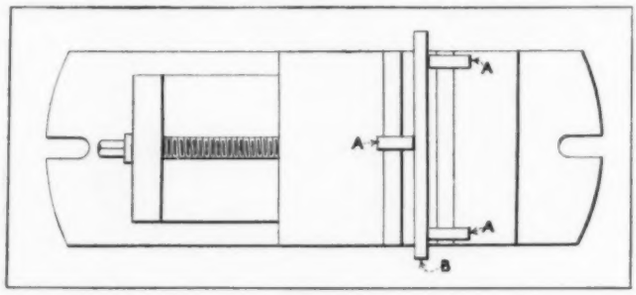
When a locomotive is to be overhauled, the man who looks after the tags is told the number of tags needed, and the number of the engine. He then sets up the number with his stamps, and makes as many tags as are necessary for the job. The tag blanks are hung on the nails shown behind the press and are taken from the distributing tool room as needed.

A Lathe Chuck as a Straightening Press—*Discussion*

By Charles Kugler

The article by Harry Moore, under the title given above, published on page 30, Vol. 68, of the *American Machinist*, reminds me of another straightening device in which standard equipment is used.

Three pieces of copper, bent as shown at *A*, are placed in the jaws of a machine vise. *B* represents the bar to



Using a vise for a straightening press

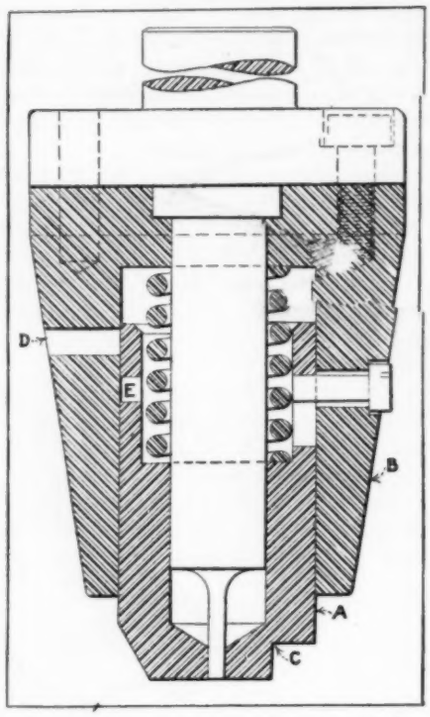
be straightened. The method of using the vise to straighten rods is obvious and needs no explanation. The same method can be applied to any bench vise.

Press Tools That Violate an Old Rule—*Discussion*

By W. H. Storey
Croyden, England

Upon reading the article by Roy E. Peterson, under the title given above, on page 593, Vol. 67, of the *American Machinist*, one would imagine that Mr. Peterson is under the impression that holes are seldom punched in stock the thickness of which is greater than the diameter of the hole. If that is the case he is certainly under a wrong impression.

So often has it been necessary, in the shop under my control, to punch holes in stock thicker than the diameter of the punch, that I designed the punch shown in the illustration as a standard tool. The punch is supported by the spring-actuated stripper bushing *A* which is in turn confined in the shell *B* attached to the punch holder. The stripper bushing can be cut away, as at *C* to clear locating pins or other obstructions. If the punch requires grinding it is not necessary to disassemble the mechanism. The stripper spring can be compressed, bringing the holes *D* and *E* fair in the shell and bushing. A wire of the proper size can then be entered into the hole in the bushing through the hole in the shell, holding the spring in the compressed position and exposing the end of the punch for grinding.



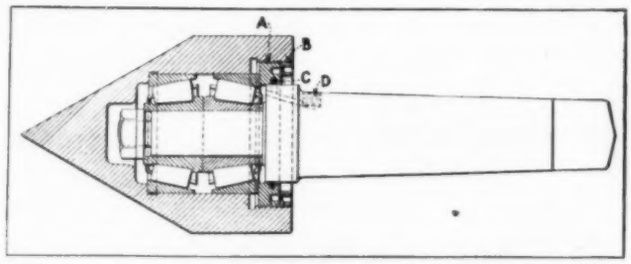
Punch for punching holes in stock thicker than its own diameter

The advantages of a standard tool of this kind are that the parts can be made in quantities and kept in stock, thus reducing the cost considerably. From these parts, a complete punch for punching any sized hole within its capacity can be assembled in a very short time—a great advantage when work is urgently required. Furthermore, the parts can be made in the toolroom during a slack period.

Heavy-Duty Lathe Center

By R. H. Lang

The illustration shows a roller-bearing center for use in the lathe tailstock in connection with heavy work. Work can be run at a higher rate of speed on this center than on the ordinary one. The roller bearings are of the



Lathe center with roller bearings

Timken precision type and can be adjusted for wear by the nut *A* and locked by the nut *B*. A feature of this center is the felt packing ring *C*, which keeps dirt and chips out of the roller bearing. The moving parts are lubricated through a ⅛-in. pipe screwed into the hole at *D*. The rollers take care of radial and thrust loads. The center has been in use in our shop for several months.

· TECHNICAL · ABSTRACTS ·

Reclaiming Car Wheels by Grinding

Re-truing car wheels of chilled iron by grinding them results in a considerable saving. Recent prices for 750-lb. cast-iron wheels were as follows: New, $17.40; second-hand, $9.55; and scrap, $6.30. To reclaim a wheel as second-hand results in a saving of $3.25, or $6.50 per pair, over the scrap value. If the reclaimed wheels were practically new and would otherwise have to be replaced by new wheels the saving would amount to $22.50 per pair.

According to the report of the car wheel committee of the American Railway Association the average cost of grinding a pair of wheels with slid flats is $1.19; which includes labor, interest and depreciation on the grinding machine, power, and grinding wheel cost. Deducting this from the above figures will show a net saving of $5.31 per pair of wheels based on second-hand value or $21.01 based on new values. To this should be added the saving represented by the cost of dismounting, boring, remounting, etc., necessary in case wheels are scrapped and replaced with others.

The time of grinding a pair of wheels will vary greatly according to the condition of the tread in regard to concentricity and to the size of the largest flat spot on the treads. It usually takes from five to ten minutes to remove a pair of wheels from the machine and set in another pair ready for grinding. The grinding time will vary from five to 40 minutes, according to conditions, so that 30 minutes per pair might be considered a fair average time from floor to floor.—*Abrasive Industry*, March.

Industrial Furnace Design

The three fundamental factors affecting the operation of a furnace are temperature, atmosphere, and pressure. In considering the phenomenon of temperature it must be understood that it is not a measure of heat input, but is a function of both heat input and heat requirement of the furnace and charge. An analogy to help explain temperature is a storage tank for liquids, where the inlet flow corresponds to heat input, the amount of liquid drawn from the tank to heat requirement, the amount remaining in the tank to sensible heat stored in the refractories of the furnace, and the height of the liquid to the degree of heat indicated by the pyrometer.

The factor of furnace atmosphere is a chemical consideration and refers to the composition of the gases resulting from the combustion of the fuel. When a fuel is burned perfectly, every part of its combustible content is oxidized and every particle of air is utilized, so that neither unburned combustible nor excess air remain. Such perfection is not possible in practice, but the proportioning of fuel to air to obtain the nearest possible approach to this condition is the purpose of atmospheric control apparatus.

The factor of pressure in a furnace is frequently neglected in furnace operation. It depends upon the amount of combustion gases generated in the furnace and the size and location of the opening through which they may escape. If they escape too easily a vacuum is created in the furnace and excess air is drawn in to oxidize the heating material, while if the openings are too small an excess pressure is established which forces flame out through the door and seals.—*Heat Treating and Forging*, January.

Baking Enamel Used for Many Parts in Twin Cities

Enameling of many parts used on electric railway cars, such as window guards, car steps, stanchions, and fare boxes, is standard practice of the Twin Cities Rapid Transit Company. Baking enamels are used and in almost every instance the parts are dipped so that all brush work is eliminated. As the air temperatures in St. Paul, in which city the shop is located, are very low in winter, a combination of dipping tank and oven was devised that provided sufficient heat to make the dipping process satisfactory.

The baking oven is 9 ft. wide, 12 ft. long and 7 ft. high. It is similar to armature baking ovens except that it is larger. The walls are of heat-insulating material and are double. Air is admitted between the outer and the inner walls and then passes downward through resistance heaters, controlled by a thermostat, and enters the interior of the oven at the bottom. After passing over the pieces being baked the heated air is exhausted through a motor-driven blower at the top of the oven. From there it passes through a rectangular sheet-metal flue, downward and beneath the dipping tank, which is placed close to the oven. After circulating beneath the tank the exhaust air is carried in a flue upward through the roof, so that the fumes from the evaporated solvents are kept out of the shop.

Small pieces such as fare boxes are suspended from S-hooks and dipped by hand. They are then hung to drain on a rod above a drainboard, so that the surplus enamel runs back in the dipping tank. Larger pieces such as the rear step assembly are hung on a hand crane. They may be lowered into the tank, lifted for drainage and then swung out of the way while thus suspended.

After dipping and draining, all of the parts to be baked are placed on a truck which carries a framework for suspending the small pieces and supporting the large ones. When the truck is filled it is run through the opened doors of the oven, the doors are closed and the baking takes place.

Enameling is done in a variety of colors, as desired. The blacks are baked at a temperature of 450 to 500 deg. F. for about one hour. Lighter colors cannot stand such a high temperature, being baked at 250 to 300 deg. F. for 2½ hours. The parts are then completely dry and ready for use.

The enameling has been found a satisfactory method of finishing miscellaneous parts. It is durable and readily cleaned. When pieces are dipped in any considerable quantity, as they are in this shop, there is a distinct economy over other finishes ordinarily used. — *Electric Railway Journal*, February 18.

Fatigue Tests of Carburized Steel

Carburizing of steel, followed by case hardening, is frequently used as the means of securing a hard wearing surface on a steel part. It also may be used to strengthen the skin of a part by increasing the carbon content, and this strengthening effect is especially marked if after carburizing a suitable heat-treatment is used.

In an effort to determine the effect of such treatment on fatigue, three steels were studied: a plain carbon steel, S.A.E. 1020; a nickel steel, S.A.E. 2320; and a chromium-nickel steel, S.A.E. 3120. Each was carburized to varying depths of case. Heat-treatment followed, which covered the various phases of oil quenching, oil quenching and refining for case and core, carburizing and cooling in air, and carburizing, cooling in air and refining case and core. In all these operations temperatures specified by the S.A.E. were used. The steels were then submitted to hardness tests, fatigue tests on a rotating beam machine, and static tensile tests.

The results indicate that carburization and suitable heat-treatment increases the fatigue strength of steel. In the case of steels cooled in the carburizing pot, the fatigue strength was distinctly less than oil-quenched steel, but subsequent refining improved it although not to equality with oil-quenched steel. However, quenching carburized steel without a subsequent grain refining heat-treatment diminishes the ductility of the steel and, presumably, its resistance to shock.—H. F. Moore and N. J. Alleman, *Transactions* of American Society for Steel Treating, March.

American Machinist

Editors: KENNETH H. CONDIT AND FRED H. COLVIN

Established 1877

Extent of Unemployment Is not Serious

REPORTS of the extent of unemployment are grossly exaggerated if the findings concerning several specific reports may be used as criteria. The Department of Labor is nearing the completion of its investigation and we should know the truth within a few days.

In the meantime nothing is to be gained by becoming panicky because of prevailing reports, most of them based on politically biased opinion rather than on fact. Our normal number of unemployed in times of prosperity is 1,000,000 or more. These people are allied with seasonal industries, are changing from one industry to another, or simply will not work full time.

More efficient production machinery and methods have caused displacement that will gradually be adjusted by the advent of new industries and by a new balance of employment requirements. There is a shifting of employees from production to service occupations as the standard of living becomes higher. More service employees are being added constantly to the automotive industry, in the radio business, and in restaurants and hotels. Such service requirements are increasing rapidly.

With general business good, with evidence to indicate that the bottom of a depression was reached several months ago, with machine tool sales indicating that preparation is being made for increased production, scare headlines announcing widespread unemployment should be disregarded.

How Labor Costs Vary

COSTS of manufacturing are always of interest—and frequently illuminating.

A recent tabulation of industrial facts by the Census Bureau of a large manufacturing city shows remarkable variations in manufacturing costs. From approximately fifty industries have been picked those industries in which machine tools played a prominent part in the product to see how they compare with others.

In all the industries using machine tools in mass production the cost of labor is low, averaging around fourteen per cent of the value of the finished product. Furniture and regular foundry and machine shops run up to twenty-eight per cent, with repair shops higher still.

It so happens that machine tools are also built in this same city and it is of interest to note that the cost of labor in the machine tool shops is forty-three per cent, not because of inefficient management but because the market for machine tools does not permit of their being built by mass production methods.

Users of machine tools will do well to consider the comparative labor costs mentioned and ask themselves what would happen to their price lists if their labor costs constituted forty-three per cent of the present value of their product. A comparison of costs and conditions frequently gives us a better understanding of the other fellow's problems.

Yes, We Need a Census of Distribution

INDUSTRY will benefit from the Census of Distribution when and if taken. Hitherto production has absorbed most of the attention of engineers and executives—rightfully so, since without the American type of production there would be little to distribute.

With production so well along, and admitting that it has not reached its peak by any means, it is time to define and to solve the problems of distribution. The elimination of distribution wastes will clear the way for even lower selling prices of necessities and luxuries, thus opening wider markets for production to supply. It is only by virtue of having large markets available that production methods in industry can meet with such success as has accompanied them throughout American industrial history.

A Census of Distribution will show how and where goods are distributed and will serve as a base on which to build sales programs, much as the Census of Manufactures has served as a starting point in the determination of output programs and marketing possibilities.

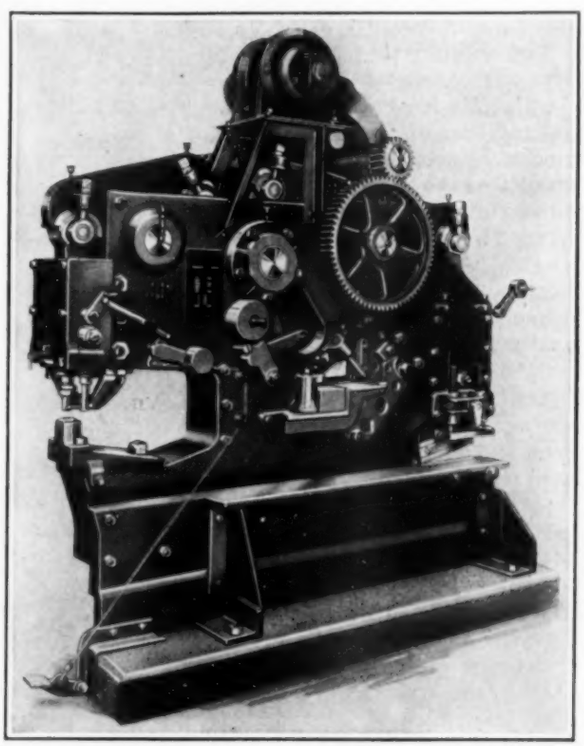
The Census Commission has recommended that authority for the taking of a census of distribution be granted and the matter is now in the hands of Congress. It is rather urgent that the action of Congress shall be favorable because a long time will be required to perfect the machinery for getting at and collecting facts, and presenting them to the business world. We cannot afford to do without a knowledge of distribution facts if we want to continue as producers and consumers of all the commodities now entering into the makeup of our high standards of living.

· SHOP · EQUIPMENT · NEWS ·

Buffalo Nos. 2½ and 3½ "Universal Iron Workers"

TWO "Universal Iron Workers" of larger capacity are offered by the Buffalo Forge Company, Buffalo, N. Y., in sizes known as Nos. 2½ and 3½. These machines are combination punches, slitting shears and bar-cutters. The throat, which is lower than in previous models of larger capacity, permits more compact design. The use of high-carbon steel castings and electric welding gives great strength to the frame. All three tools are actuated during the course of one revolution by a single eccentric. Since they do not act in unison, overloading is avoided. This construction permits using the three separately-controlled parts of the machine at the same time. Other features are: Interchangeable high and low die blocks, exceptionally long shear blades which are reversible, bar-cutter same as on the high-throat machines and an optional triple-punching arrangement.

The No. 2½ "Armor-Plate" machine has a capacity to punch holes 1 3/16-in. in diameter through ¾-in. plate, notch 3⅜-in. angles, shear ¾-in. plates through the center, cut 2¼-in. round and 2-in. square bars and 6 x ½-in. 90-deg. angles. It has a depth of throat of 20 in. and a length of knives of 12 inches. The No. 3½ machine has sufficient capacity to punch holes 1¼-in. in diameter through ⅞-in. plate, notch 3½ x ⅜-in. angles, shear ⅞-in. plates through the center, cut 2½-in. round and 2⅛-in. square bars and 6 x ⅝-in. 90 deg. angles. The depth of throat is 20 in. and the length of knives is 13¾ inches. The No. 2½ machine is driven by a 10-hp. motor and occupies a floor space of 7 ft. 4 in. x 4 ft. It will deliver 28 strokes per min. from a height of 1½ in. The height of this machine is 6 ft. 10 in. and the weight is 8,250 lb. The No. 3½ machine is driven by a 15-hp. motor and occupies a floor space of 8 ft. x 4 ft. 3 in. It will deliver 26 strokes per min. from a height of 1¾ in. The height of the machine is 8 ft. 8 in., while the weight is 9,600 pounds.



Buffalo No. 2½ "Universal Iron Worker"

Ross "Big Boss" Grinding Wheel Dresser

A dresser for truing grinding wheels of 36 and 42 in. in diameter or larger at high peripheral speeds has been put on the market by the Ross Manufacturing Company, Cleveland, Ohio.

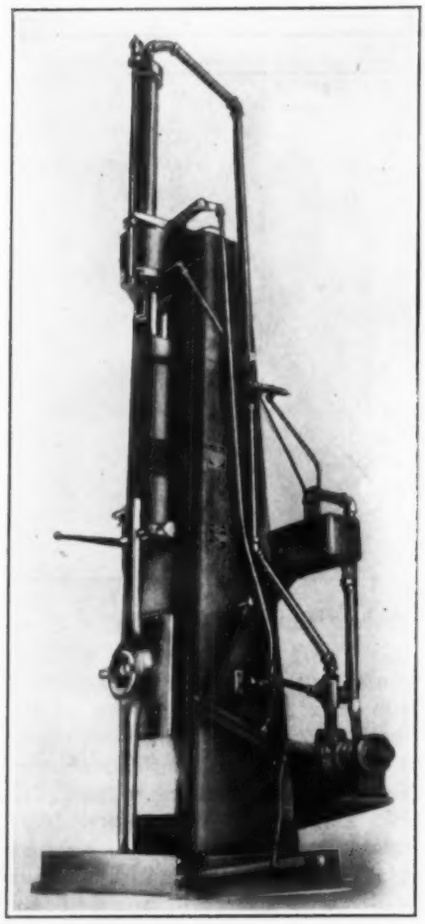
The dresser is designated as the "Big Boss" model and is equipped with thirteen 3 5/16-in. cutting disks. The purpose of the large disks, it is pointed out, is to maintain a correct ratio with the circumference of the wheel, slowing down the revolutions of the disks and giving them longer life and greater cutting speed. The disks are mounted on a flatted sleeve which turns on bearings of a 1½-in. outside-diameter. They are specially heat-treated and form an open pattern that does not fill up with wheel particles. The pattern is also said to remove the loaded surface without dulling the fresh crystals. A feature of the tool is the slotted holder-head permitting quick removal of the cutting assembly for replacement of disks.

Dust washers seal the bearings of the tool against grit. A "double adjustment" device is incorporated to prevent the bearing assembly from developing end play and looseness.

Ross "Big Boss" Grinding Wheel Dresser

American Hydraulic Axle-Broaching Press

A special press for broaching out the flash thrown up from welding operations on automobile rear axle cases has been developed by the American Broaching Machine Company, Ann Arbor, Mich. The illustration shows the machine without the broach in place. The broach is carried in a rotating head and cuts on its downward stroke. Upon completing the cut, the head rotates by means of a cam device attached to an angle plate which, in turn, is attached to the frame proper.



American Hydraulic Axle-Broaching Press

This movement brings the broach out of the path it traveled on its downward stroke, and allows the cutter to be withdrawn through the housing without any interference or dragging.

The housing is carried on a large stud and is centered by means of a special device at the upper end. The operation of broaching both ends requires about one minute.

The machine is driven direct by a 10-hp. motor. It is equipped with automatic stops for regulating the length of stroke and is arranged with a pedal as well as a hand-lever control. It occupies a working space of 6 ft. square, and has an overall operating height of 17 ft. The machine has a rated capacity of 12 tons, and has a stroke of 24 inches.

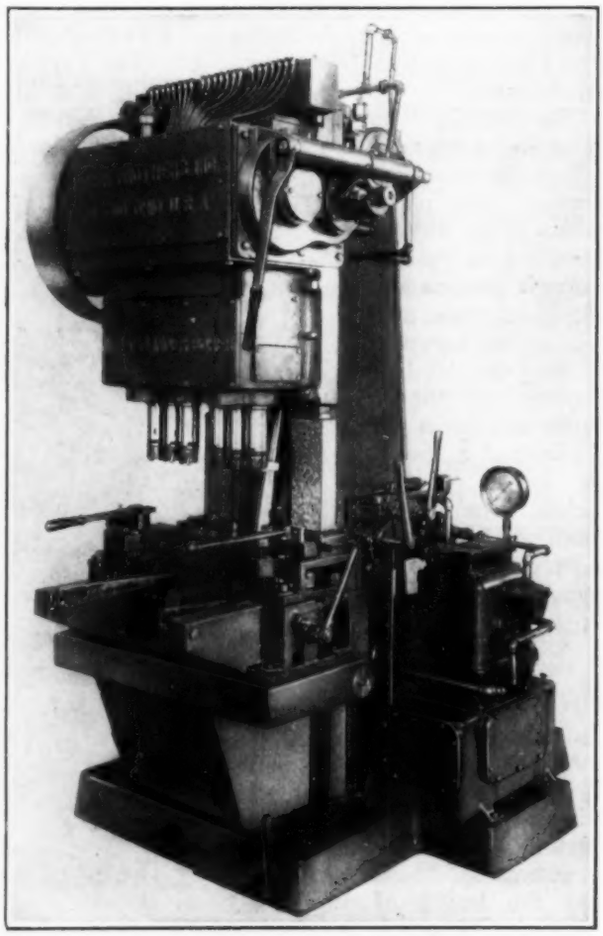
"Teggo" Hand Compound

"Teggo" hand compound is a creamy white paste which is distributed by the Teggo Manufacturing Company, 1755 North Troy St., Chicago, Ill. If rubbed on the hands before starting work, it penetrates the pores of the skin where its antiseptic properties prevent skin diseases from originating in the case of minor abrasions. It leaves a protecting film over the skin and no matter how stained or dirty the hands become, they can be washed clean with common soap and water. Teggo is put up in convenient tubes.

Baker Multiple-Spindle, Hydraulic-Feed Cylinder-Boring Machine

THIS machine which employs Oilgear hydraulic feed has been placed on the market by Baker Brothers, Inc., Toledo, Ohio. It is made with fixed centers with any required spacing and can be furnished for two-, four-, six- or eight-cylinder blocks.

The spindles are of forged high-carbon steel and are of maximum diameters governed by the center distance of the bores of the blocks. Two ample-size taper adjustable bearings are provided located at the lower end of the head as close to the start of the cut as possible. The boring construction is such that the boring bars need no support either on roughing or finishing cuts. The speeds for the spindles are designed with regard to the size of the bores of the cylinder block. Mechanical stop and start of the spindles is provided through means of a conveniently placed lever. The machine has table feed actuated by the Oilgear hydraulic pump with rapid advance to the work, automatic engagement of feed at any predetermined point and automatic rapid return. At the end of the cycle the machine stops automatically. The position at which the change from rapid traverse to working feed takes place can easily be altered. This movement is made by flat cams which can be set at any position. Of course, the rate of feed is also easily adjusted. The rapid traverse and quick return are constant, however. The table is arranged with taper take-up gibs against the slides of the main frame and has an extra-long bearing on its ways. The feeding of the table is accomplished through means of a cylinder mounted on a pivot at the top of the main frame. This cylinder is mounted at an angle and besides feeding the table up, it also applies a thrust component that holds the table rigidly against the ways of the ma-



Baker Multiple-Spindle, Hydraulic Feed, Cylinder Boring Machine

chine and insures accuracy and positive alignment at all times. The main drive, in the head of the spindles, is through hardened alloy steel gears, the shafts being mounted on ball bearings. The Oilgear pump is driven by a 2-hp. motor which is furnished with the machine as standard equipment.

General Electric Pot-Type Electric Furnaces for Lead Hardening

An addition to its line of electric-heating equipment has been announced by the General Electric Company, Schenectady, N. Y., in the form of a pot-type electric furnace, shown in Fig. 1, for lead hardening, designed to operate at temperatures up to 1,600 deg. F. In Fig. 2 is shown a cross-section of the furnace.

This furnace the manufacturer claims, consumes less current than any other pot-type furnace of similar size and capable of doing the same work. It utilizes the standard method of submersing the work in a bath of molten lead, and is particularly suitable for hardening and tempering chisels, files, drills, taps, dies, and other small tools or parts entering

Fig. 1 — General Electric Pot-Type Electric Furnace for Lead Hardening

into the manufacture of a high-grade finished product. The four sizes now in manufacture cover a wide range of production conditions and are suited to a multiplicity of applications. The smallest has a maximum capacity of 75 lb. of steel per hour at 1,500 deg. F., an inside pot diameter of 8 in., a depth of 12 in. and an overall diameter of 32 in and a working height of 32 in. The connected load on this

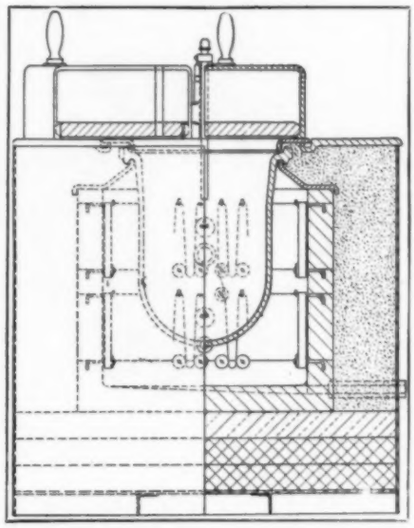


Fig. 2—Cross-sectional view of a pot-type electric furnace

size is 11 kw., and the pot operates on 75 volts, single phase, transformers being provided for stepping down the voltage from 220, 440 or 550 to the working voltage of this and the next larger size furnace.

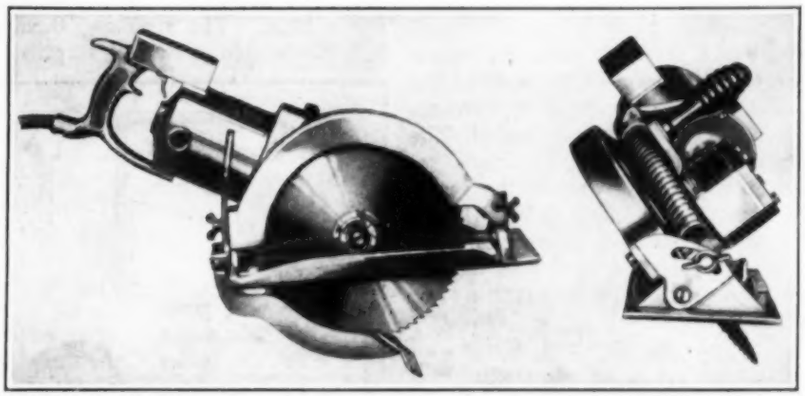
The next size in the line has a maximum capacity of 123 lb. of steel per hour at 1,500 deg. F. Inside dimensions are 12 in. diameter and 18 in. depth. The working height is 37 in., and outside diameter 37 inches. The connected load is 16 kw., and the power supply voltage is 110, single phase. A third size has a maximum capacity of 250 lb. of steel per hour at 1,500 deg. F. Inside dimensions are 16 in. diameter, and 18 in. depth. Working height is 45⅜ in., and outside diameter 46¾ inches. The connected load is 29 kw., and the power supply is 220 volts, single phase or direct current. The largest size has a maximum capacity of 250 lb. of steel bar at 1,500 deg. F. Inside dimensions are 16 in. diameter, and 24 in. depth. Working height is 45⅜ inches. Outside diameter is 46¾ inches. The connected load is 29 kw., and the power supply 220 volts, single phase or direct current.

In explanation of the small current consumption of this furnace, the manufacturer calls attention to the construction, the inner melting pot not extending over the top of the furnace. As a result, very little heat is lost by being conducted out by the pot.

The principal features of the furnace as listed by the manufacturer are: minimum current consumption; uniform quality of product; lack of contact of pot with shell or cover of furnace; use of direct-heat, unmuffled heating unit of the metallic-resistor type, ease of removal of pot; improved working conditions which result; and reduced fire hazards.

"Wodack" High-Speed Portable Electric Hand Saw

Two important features are incorporated in the Type B portable electric hand saw manufactured by the Wodack Electric Tool Corporation, 4627 West Huron St., Chicago, Ill. The first provides for bevel sawing at any angle up to 60 deg. This is accomplished by a tilting saw-base which can be set and locked at any angle within this range by means of a slide and locknut, as shown in the illustration. The other feature is that of the width gage for vertical sawing which can be set for any width from 0 to 6 in. By the use of this gage various widths can be sawed without the necessity of marking and with



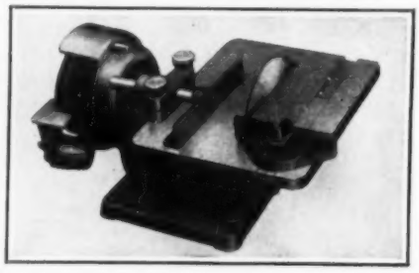
"Wodack" High-Speed Portable Electric Hand Saw

considerable accuracy and uniformity.

The machine operates on 110, 220 and 250 volts and is supplied with a universal motor of special design. Each saw is furnished complete ready for use with one 11-in. and one 9-in. blade.

Black & Decker Electric Saw Table

An electric saw table has been devised by the Black & Decker Manufacturing Company, Towson, Md., which extends the scope of the company's combination grinder. This device can be quickly mounted on the grinder. Work can be sawed accurately on any angle up to 45 deg. The table may be raised or lowered to fit all requirements. While wood can be sawed up to 1¾ in. in thickness, the machine will also saw aluminum, brass, copper, Bakelite and fiber.



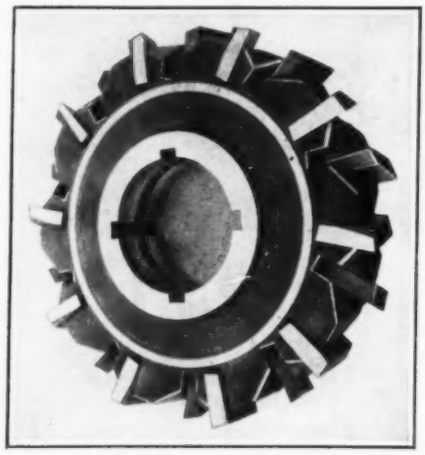
Black & Decker Electric Saw Table

O. K. Heavy-Duty Milling Cutters

A heavier line of slotting and facing milling cutters has been added by the O. K. Tool Company, Inc., Shelton, Conn. Blades of ¾-in. thickness have been developed to take as severe a cut as any of the latest milling machines will pull.

The O. K. blade, which is tapered and has a serrated back, fits into a corresponding slot in the body of the milling cutter which is a chrome-nickel steel forging, heat-treated. The tapered surface locks the blade securely in the body, while the serrations permit the blade to be adjusted for wear. The blade is made of drop-forged high-speed steel, the forging operation densening and refining the grain structure.

Any of the standard designs of cutters are made, such as slotting cutters, side mills, either straight or angular half-side mills, face mills, etc. A suitable rake and spiral angle as well as adequate chip clearance is provided to suit the conditions obtaining.

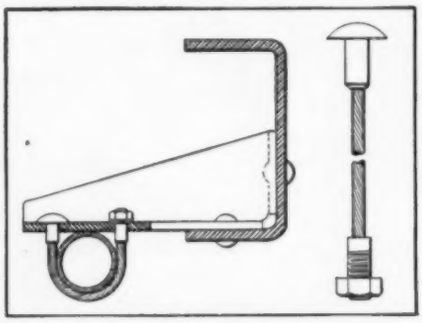


O. K. Heavy-Duty Milling Cutter

"Tru-Lay-Tru-Loc" Flexible Bolt

Through the development of the preformed type of wire rope the American Cable Company, 215 North Michigan Ave., Chicago, Ill., has recently perfected the "Tru-Lay-Tru-Loc" flexible bolt illustrated. It may be used in places where rigid U-bolts are impracticable.

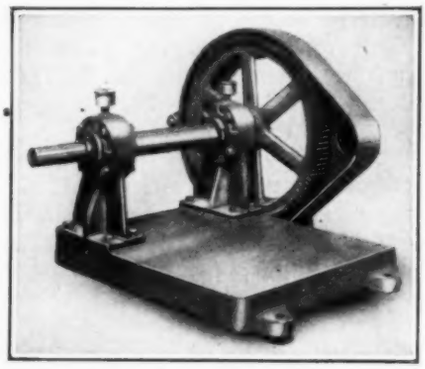
Preforming the wires and strands to the exact helical shape they must assume in the completed rope results in a cable that does not require seizing but may be cut like a rod. This type of rope permits a close-fitting attachment to be slipped over the unseized end of the rope and to be processed so that the steel of the fitting cold flows into the interstices of the rope and thus becomes practically an integral part thereof. Such fittings can be threaded for a nut or capped for a head. The resulting flexible bolt is available in varying lengths.



"Tru-Lay-Tru-Loc" Flexible Bolt

Type C-R Gear-Reduction Motor Base

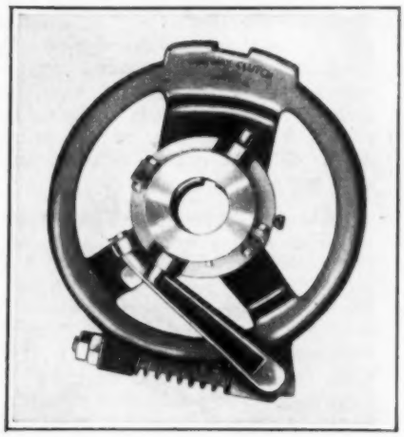
The entire line of speed-reduction geared motor base units manufactured by the Bridgeport Motor Company, Inc., 105 Kossuth St., Bridgeport, Conn., can now be furnished equipped with Hyatt roller bearings instead of plain sleeve bearings. Beside the anti-friction features resulting from the use of the roller bearings, the base may be mounted in an inverted position or at any angle without special attention to the bearings, so long as the shaft remains horizontal. Bases intended for locations demanding a drive other than horizontal are provided with Timken bearings. The sizes range from ¼ to 12 hp., and the reductions available are 3, 4, 5, 6 or 7 to 1. Standard units are furnished for right-hand drive. Left-hand drive units may be supplied upon specification.



Type C-R Gear-Reduction Motor Base Unit

Conway Compression Clutch

This large compression clutch has been introduced by the Conway Clutch Company, 1956 W. Switch St., Cincinnati, Ohio, for use where the shaft speed does not exceed 300 r.p.m. The company claims as salient features easy engagement, instant release, dragfree idling and exceptionally high-power capability. The clutch is made in four sizes having a fixed capacity for transmitting up to 75 hp. at 100 r.p.m. and the diameters of the friction surfaces are from 12 to 20 in. The device is of compact construction both as regards the swing



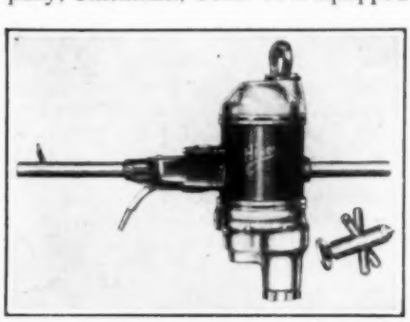
Conway Compression Clutch

diameter and the lengthwise shaft space required for a given horsepower.

This clutch is operated by the familiar form of shifter yoke, which slides a cone member under a roller on the end of the operating lever. When the cone slides under this lever, contracting the friction band, the high-leverage ratio assures the application of ample driving power. When the operating lever is thrown in the reverse direction to release the clutch, a spring assists the friction band out of engagement. This device is of all-steel construction and the shifter cone is made of hardened steel. The friction lining may be replaced by simply removing two screws and shoving the pulley, sprocket or drum along the shaft a distance slightly more than the width of the friction band.

"Hisey" 1¼-Inch Universal Drill

A universal drill of 1¼-in. capacity embodying several noteworthy features has been placed on the market by the Hisey-Wolf Machine Company, Cincinnati, Ohio. It is equipped with a standard "Hisey" motor mounted in ball bearings. The brush holders have adjustable spring tension and are mounted as a separate unit on a Bakelite yoke. All gears including that on the armature shaft, which is removable, are heat-treated. The spindle is fitted with a No. 3 Morse taper socket. It is hardened and ground and is automatically lubricated through the gear case.



"Hisey" 1¼-Inch Universal Drill

"Stick-To" Chucks and Double-Twist Drills

"Stick-To" chucks and double-twist drills are being marketed by the Specialty Trading Corporation, 551 Fifth Ave., New York, N. Y. They are of Swedish manufacture and the materials are claimed to be of the best.

The chuck consists of four parts as shown in Fig. 1. The principal parts are the hollow arbor and the outer sleeve which when screwed together hold the drill firmly with the aid of internal-taper surfaces, a jamb sleeve and collar. The material is held at two points, providing eight contact points. It is claimed that the chuck grips the twist of the drill without marring or dulling its cutting edge.

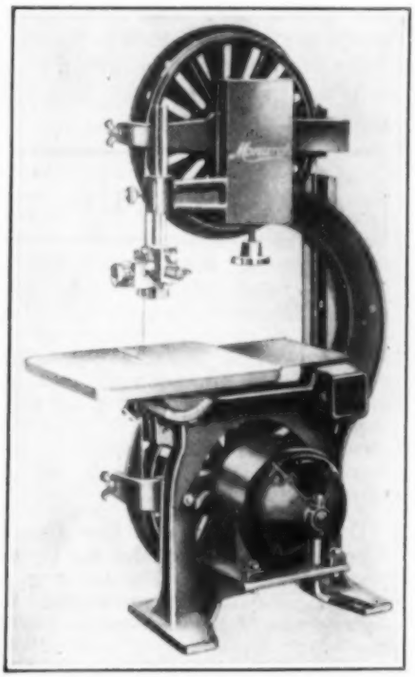
Fig. 1—Above—Elements of the "Stick-To" Drill Chuck: Arbor, Outer Sleeve, Collar and Jamb Sleeve. Below—Assembled Chuck. Fig. 2—Stick-To Double-Twist Drill

Stick-To drill chucks may be used for rough as well as for precision work. The projection of the twist drill outside the chuck may be regulated to the depth of the hole or to the most effective and economical free length desired. It is recommended for use with the quick-change collet system, multiple-spindle work, both drilling and tapping, as the diameter of the chuck is so small that it will work in very close quarters.

The double-twist drills are made from carbon steel and high-speed steel. The hollow spindle of the Stick-To chuck is proportioned to accommodate these drills. When one end of the drill becomes dull, much time can be saved by simply inverting the drill in the chuck and using the other end. The full length of the drill can be consumed satisfactorily.

Monarch Bench Bandsaw

All the latest safety features have been incorporated in the Monarch bench bandsaw recently developed by the American Saw Mill Machinery Company, Hackettstown, N. J. The locking hinged-wheel guards make for safe operation and at the same time provide an easy method for replacement of saws. Difficult work is facilitated by the large tilting table and the smaller stationary table behind it. Twisting of the blade is avoided by the adjustable lower guide and the upper roller guide which is mounted on a strong hexagonal guide post. Six inches of clearance be-



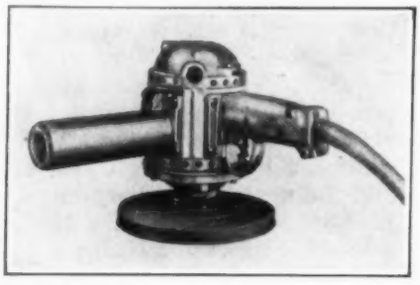
Monarch Bench Bandsaw

tween the guide and the table provide ample room for large stock.

This machine, which measures only 36 in. in height, is claimed by the makers to perform 90 per cent of the work of a large machine. Either a.c. or d.c. motor drive is available or the saw may be driven through a belt. Westinghouse motors, circuit breakers and switches are supplied as standard equipment. A long cord enables the operator to plug in on any ordinary light socket.

Black & Decker Electric Sander

An electric sander has been introduced by the Black & Decker Manufacturing Company, Towson, Md. The sand pad is electrically-driven by a powerful motor through a train of steel gears, heat-treated and



Black & Decker Electric Sander

running in a grease-tight compartment. The motor and all revolving shafts are mounted in ball bearings. The machine is operated with a pistol grip and trigger switch. It can be supplied for all voltages.

Trade Catalogs

COMPRESSORS, TURBINE. The Garden City Fan Co., Chicago, Ill., has prepared a bulletin on its cycloidal turbine compressors which are suitable for installations where pressures of from 1 to 5 lb. per sq.in. are required. Performance curves for constant speed and varying speeds are included. These machines are built with pulleys for belt drive, or with direct-connected motors or steam turbines.

DRUM CONTROLLERS. The General Electric Co., Schenectady, N. Y., has issued leaflet GEA-887, showing its line of CR-3110 drum controllers for series- and compound-wound motors used on crane hoists and similar applications. They are built in sizes from 10 to 50 hp., operating on 115, 230 and 550 volts. Operating devices, resistors, and auxiliary panels are included.

ELECTRIC HOISTS. The Chisholm-Moore Manufacturing Co., 5046 Lakeside Ave., Cleveland, Ohio, has issued Bulletin No. 31, showing the constructional features of its entire line of electric hoists. Each feature is illustrated and described. Simplicity of design, flexibility, ease of operation, and life are stressed. Many cuts of actual installations are given. Complete specifications, important dimensions and other data are included.

ELECTRIC STARTING EQUIPMENT. The Allen-Bradley Co., Milwaukee, Wis., has published additional bulletins and price lists of recent equipment and standard lines. Starters, across-the-line switches, reversing switches and push-button stations are covered. Each article is illustrated and fully described. This material is meant to be incorporated in the catalogs already in the hands of the customers.

HOISTING MACHINERY. The Silent Hoist Winch and Crane Co., 762 Henry Street, Brooklyn, N. Y., has issued Bulletin No. 27, showing several types of worm-driven hoisting machinery such as vertical- and horizontal-capstan winches and single- and double-drum winches. Each type is available in several sizes, with either electric-motor or gasoline-engine drive. Specifications are not given, but several applications of the apparatus are shown.

LATHE, AUTOMATIC. The Sundstrand Machine Tool Co., Rockford, Ill., has prepared a bulletin on their automatic production lathe. It contains complete specifications and many detailed descriptions of the important features. An excellent illustration is used to analyze pictorially the various portions of the machine. The operation of each part is explained in detail.

MOTORS, POLYPHASE INDUCTION. The Allis-Chalmers Manufacturing Co., Milwaukee, Wis., has prepared a well-illustrated catalog showing the various features of the design of types "AR" and "ARY" squirrel-cage and slip-ring type general-purpose motors. A line of suitable starting apparatus is also included. Correct installations of motor and starting apparatus are shown. The publication is known as Bulletin 1118-E. It contains sixteen pages.

WELDING EQUIPMENT, ARC. The Lincoln Electric Co., Cleveland, Ohio, has issued a bulletin describing the accessories for its arc welder. Each accessory is illustrated. The line includes shields, special cable, electrode holders, brushes, gloves and aprons. Various types of the Lincoln arc welder are also shown. Prices are also given.

RAILROAD TURNTABLE CONTROL. The General Electric Co., Schenectady, N. Y., has issued descriptive sheet GEA-890, showing various types of railroad turntable control equipment, such as motors, drum switches and panels, for either a.c. or d.c. installations. Illustrations of actual installations are given.

SHAPERS, STEPTOE. The Western Machine Tool Works, Holland, Mich., has issued booklet No. 30 which describes a new line of Timken-equipped Steptoe shapers. Important assemblies as well as each size shaper are illustrated by photographs and blueprints. Complete specifications and part lists are furnished. The publication contains 20 8½x11-in. pages and is pleasingly arranged.

SHEARS, SHEET AND PLATE. The Streine Tool & Manufacturing Co., New Bremen, Ohio, has issued a bulletin describing its line of "Stamco" sheet and plate working machinery, which comprises corrugating rolls, crimping rolls, sheet presses and shears which are both of intermittent and continuous types. Each type of machine is illustrated. The continuous shears are a specialty.

Pamphlets Received

WASTE ELIMINATION. Two pamphlets were recently issued by the United States Bureau of Standards under the auspices of the Division of Simplified Practice of the Department of Commerce. Bulletin No. 60 contains recommendations for the elimination of waste in packing carriage, machine and lag bolts. Bulletin No. 63 treats of the same subject in connection with the manufacture of metal spools for annealing, handling and shipping wire. Each publication contains a list of concerns subscribing to these standards. Copies may be obtained from the United States Printing Office, Washington, D. C. at five cents each.

ROLLER BEARINGS IN RAILROAD SERVICE. The International Nickel Co., Inc., 67 Wall St., New York, N. Y., has available for distribution two pamphlets entitled "Nickel Alloy Steels for Roller Bearings," and "Roller Bearings in Railroad Service." The first, which is by Dr. F. C. Langenberg and Charles McKnight, contains details of construction of nickel alloy steel bearings carrying heavy loads at high speeds with tables showing the physical properties required of the materials used to meet this severe service. The second article gives the performance records of the Chicago, Milwaukee and St. Paul Railroad trains equipped with roller bearings and details of improvements in operation secured with savings effected by their use.

NEWS OF THE WEEK

Chicago Engineers Hold Machine Shop Practice Meeting

AT THE annual machine shop practice meeting of the Chicago section of the American Society of Mechanical Engineers, held March 14, at the Morrison Hotel, five papers dealing with plant operation and production methods were presented. Included among the 300 present were not only the A.S.M.E. membership, but also members from the Society of Automotive Engineers, the Western Society of Engineers, the Machinery Club, the Illinois Manufacturers Association and the mechanical division of the Chicago Association of Commerce.

After opening remarks by Thomas Wilson, chairman of the Chicago section, the afternoon meeting was turned over to Frank W. Curtis, Western editor, *American Machinist*, who presided. Following two short motion pictures, "Vizualize," and "High Lights in Studebaker Production," the afternoon papers were given, these being, "Development of Fully-Enclosed Gear Drives for Industrial Speed Reduction," by J. A. Marland, engineer, W. A. Jones Foundry and Machine Company, Chicago; "Special Machinery for Mass Production," by H. L. Blood, chief of machine design division, Western Electric Company, Chicago; and "Stopping Production Leaks Through a Simplified Production Control," by K. R. Wood, works manager, Bell & Howell Company, Chicago.

The evening program included two papers, "The Production of Pressed-Steel Frames by Automatic Machinery," by John P. Kelley, sales manager, A. O. Smith Corporation, Milwaukee; and "The Relation of Chromium Plating to Industries and the Truth About Its Value and Application," by Dr. J. Becker, chief research chemist, of the Vacuum Can Company, Chicago, after which followed a motion picture dealing with the assembly of the new Ford car.

In describing the use and application of chromium-plating, Dr. Becker said: "Chromium as a metal or when applied in a homogeneous plate as a protective coat upon other metals resists corrosion, rust, wear, abrasion, erosion, friction, intense heat, alkalies and most organic or inorganic acids. It is clearly apparent that since the factors which produce the greatest values in chromium plating are extremely variable instead of constant, delicately worked out experiments and accurately tabulated processes and technique for each type of articles or parts are vitally essential. Quality in chromium plating is determined by the particular character, thickness and hardness of the chromium deposit that best suits the requirements of a certain article or part, and is best adaptable to the metal of which the article is made and which gives maximum service at minimum cost.

Discussing the production of automobile frames, Mr. Kelley took up the details of the nine sub-divisions, or units of frame construction, starting with the automatic inspection of materials to the finished frame storage. A motion picture showing the construction of frames was shown in connection with the paper.

Larkin Packer Co. Buys Davis Boring Tool Co. at Receivership

Purchase through receivership of all the property and entire assets of the Davis Boring Tool Co., Inc., St. Louis, Mo., by the Larkin Packer Co., manufacturer of expansion boring bars, of that city, has been announced by officials of the Larkin concern. For some time past the Davis Boring Tool Company has been in receivership and public sale was held by order of the Circuit Court. The amount involved in the purchase, while not official, is understood to be about $225,000.

The Larkin Packer Co. was founded in 1905 by John J. Larkin to engage in the manufacture of oil well supplies. Originally the plant was located in Bartlesville, Okla., but later was moved to its present location.

Tentative plans call for the separate operation of both plants with the Davis Boring Tool Co. preserving its identity as a division of the Larkin Packer Co. with works at 3693 Forest Park Boulevard. General offices will be maintained at the Larkin plant and general purchasing will be conducted from this point.

While no changes now are in prospect on the product itself, several changes will be made in personnel and in plant operation. All the executive heads of the former Davis company are eliminated and sales territories are being revised to include representation in all principal centers. Standardization and intense production methods will be employed in the manufacture of boring bars, reamers, cutters, etc., to assure a product of uniform high quality. Plant facilities include more than 200 machine tools.

It is planned to ship from stock on standard items and to make deliveries in one week on boring bars and reamers, with two- and three-day shipments on special cutter orders. The Larkin Packer Co. will continue solely with the manufacture of oil field equipment. All boring bar, cutter and reamer operations will be centered at the Davis plant with J. J. Larkin as active head of both concerns. J. E. Kilser will continue as assistant general manager of operations.

Soviet Power Development Shows Big Pre-War Expansion

Practically all Soviet industries show increase over the pre-war level, it is revealed in the "Economic Statistics of the Soviet Union" an 80-page handbook recently issued by the Amtorg Trading Corporation of New York. The monthly industrial output is shown to be 10 per cent greater than the average for Russia in 1913.

One of the most impressive developments in comparison with pre-war conditions is shown by power plant operations. The public utility plants of the United Soviet State Railroads produced in 1927 three times the energy produced in 1913, nine regional power stations have been constructed and over twenty large stations are under construction.

Soviet-American trade for 1927 amounted to $100,000,000, as compared with $48,000,000 prior to the war.

Development of new types of fuel is reflected in the figures for the production of peat which was 5,900,000 tons for 1927, four times the pre-war total. In the past five years the value of the output of large state industries has increased four-fold, and in the past two years 64 per cent.

Russia is shown in the economic statistics still to be deficient in the production of iron and steel and iron ore. On the other hand, production of machinery, and especially of agricultural implements is much greater than ever before. A great variety of machinery, electrical apparatus and chemicals, not manufactured in pre-war Russia is now being produced on a large scale. Statistics show that the number of workers employed in large-scale industries exceeds by a small margin the 1913 figure, while the length of the working day now is on the average only 7½ hours as compared with 10 in 1913.

The Business Barometer

The outlook in Commerce, Finance, Agriculture and Industry

By THEODORE H. PRICE

Editor, Commerce and Finance, New York

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IN 1720 an epidemic of stock speculation swept over England. It was called the "South Sea Bubble," and was started by the advance in the stock of the South Sea Company which rose from its par value of 100 pounds sterling to over 1,000 pounds per share. This company had a capital of ten millions sterling. It was formed in 1710 to trade with the South Sea Islands and by 1720 it had become so successful that it undertook to refund the national debt of Great Britain, which then amounted to about 31,000,000 pounds sterling. Extravagant estimates of the profit that the company would make led the public to buy its shares recklessly, and as they went up some 86 other companies were formed and readily floated in London. One of these companies, which claimed to have a "perpetual motion wheel," raised a capital of a million sterling, and another, organized to "carry on an undertaking of great advantage but nobody to know what it is" sold 5,000 shares at 100 pounds each.

All classes of society joined in the orgy of stock gambling that ensued, and even the Prince of Wales became governor of one company out of whose stock he is said to have made 40,000 pounds. Writing of the period a contemporary historian says "Some of these schemes were plausible enough, and had they been undertaken at a time when the public mind was unexcited they might have been pursued with advantage to all concerned."

These allusions to what happened two centuries ago may or may not be relevant in a review of last week's business in the United States, but to one who knows his New York and his Wall Street they are at least suggestive. A seat on the New York Stock Exchange has sold for $315,000 and trading on the floor of that institution has attained a volume never before reached. The same thing is true of the Curb and what is called the "Over the Counter" market, where the shares of insurance companies, banks, investment trusts, and many other unlisted corporations are bought and sold. It is also true of many other stock exchanges in this country and Canada, including particularly San Francisco, Chicago, Toronto and Montreal. Men and women in every walk of life seem possessed by a mania to buy something and a tip that "A.O.T." (any old thing) is going up will get prompt action whereas a convincing demonstration of its worthlessness would be ignored.

In the circumstances it is hardly necessary to observe that many stocks advanced sensationally last week. Those who chronicle such movements say that the advance was due to the covering of shorts. If they are right the bears lost heavily, but bears are timid animals and their losses as well as their commitments have probably been exaggerated. They feel that a turn in the tide is inevitable, even though it may be postponed, and for this reason they are buying and borrowing as little as possible. Of course this attitude makes for safety and it must be admitted that most distributors are in a very sound position insofar as their stocks and liabilities are concerned.

But it must also be admitted that the volume of business is disappointing, and that the increase which the chain stores report is largely at the expense of the so-called independents who are rapidly becoming dependents. One consequence is the overproduction with which trade institutes are trying to cope by advising curtailment, and another is the unemployment that has been somewhat lessened by putting the jobless to work on public improvements that can be paid for by selling municipal and state bonds.

Meanwhile the key industries are about as they were and the commodity markets have been comparatively quiet. It is said that the "upswing in steel has slackened" and while there is no doubt that the General Motors is selling more cars than at any time previously, it is questionable whether the other companies are doing so well.

The F. W. Dodge Co. says that the building industry is looking up, but a recession from last year is admitted, and in New York at least rentable space is in better supply at lower rates. Freight car loadings for the week ending March 3 show a decrease of 3½ per cent as compared with last year, but the deficiency is more than accounted for by the coal traffic which is still sub-normal. In the oil and lumber industries profits have also been cut to the vanishing point by overproduction and no cure for it has as yet been found.

From Europe a continued improvement is reported. British trade shows a further gain and the "gold cure" seems to be working wonders in France. It is expected that the Bank of France will gradually recall about $250,000,000 of the gold it has on deposit here and in London. As a result, *rentes* have advanced sharply and some predictions of a rampant bull market are now to be heard on the Paris Bourse.

If these predictions are realized and the result should be considerable shipments of gold from this country it would not be regrettable. Credit inflation is largely responsible for the distension in the stock market, and some contraction in loans would be salutary.

WHAT'S DOING IN INDUSTRY

AFTER pausing for breath in the first week of March, the machine tool industry has swung into line again and the steady upward trend is resumed. Inquiries are in abundance, and there are many indications that the first half of 1928 will see a record business placed. This conclusion is checked by figures of the National Machine Tool Builders' Association which indicate that February business was the best for that month in some years.

AUTOMOTIVE activity is no doubt responsible for a large portion of this business. Automobile sales, excluding Ford, in February, were close to previous records and production has naturally followed close behind. As a result, employment in Detroit, Indianapolis and Milwaukee is booming and many men are being attracted from less fortunate centers. In Canada, also, automotive production is high.

RAILROADS for the first time this year are beginning to do some real buying. Several shops in the South are being equipped, some roads in the East are placing orders, and in Chicago at least one road is considered to be active. These reports come in despite rumors and trade reports to the effect that railroad revenue has fallen off and that idle locomotives are filling the yards.

OTHER active lines are road-building equipment, woodworking machinery, and agricultural machinery. Textile machinery in the South is also beginning to emerge from its lethargy.

The Industrial Review

Weekly progress of the machinery and machine tool business

THE following reports, gathered from the various machinery and machine tool centers of the country, indicate the trend of business in these industries and what may be expected from the future:

DETROIT

The feeling of optimism that has permeated and, in fact, dominated the machinery and machine tool market here is just as apparent now as it was two months ago and in many ways is much more tangible and much more justifiable.

The prospects for an unusually good month are excellent and many dealers believe the proceeds of March will exceed those of February, which was an exceptional month. Here and there throughout the entire automotive industry and throughout all of the allied industries there is a balancing up process going on. Most of the plants are in heavy production and because their stocks of equipment and tools were very low last year they are required to buy a few machines here and there just to take care of the gradually increasing output.

This means, of course, a constant stream of orders, some of them fairly large, some of them small but the total grist making a rather formidable amount. Most of the dealers in machinery and machine tools are very busy and most of the producers are behind in their orders. The small shops are generally rather busy.

For the past few weeks there has been a large and steady stream of returning workers and their families, most of whom had moved away when things began to slacken up 18 months ago. The motor car plants now are nearly all taking on men and although there is still no shortage of available help (except in certain branches of skilled labor) this stream continues to pour in.

CANADA

Continued improvement is noted in the machinery and machine tool industry in Canada, and the outlook for the metal-working industry generally is good. Present indications are that this is going to be an excellent year for manufacturers of mining machinery and equipment. Already inquiries from the principal mining areas of Manitoba, Northern Ontario and Northwestern Quebec are considerably in excess of last year. There is also a brisk demand for construction equipment and for road-building machinery, particularly in Western Canada.

Most of the large engineering plants are busy. The Canadian Car and Foundry Co. is working on steel frames for General Motors, and on a contract for 40 cars for the Montreal Tramways. This order involves some $700,000. The Dominion Engineering Works, Ltd., has been well occupied throughout the past year, and it had been found necessary to augment manufacturing facilities. Concluding a gratifying report on the operations of the Canadian Locomotive Co., Ltd., during the year 1927, William Harty, Jr., chairman of the board said: "With the amount of railway construction provided for 1928, we feel that in a short time the locomotive industry will be in a more prosperous state."

The automotive plants are speeding up. General Motors of Canada created a new record in January and February. Production for these two months was very close to the figure for the peak months of last year, which was the largest in production and sales in the company's history. The Canadian Ford plant is now employing 3,000 workers. During the past six months 1,500 men were added to the staff.

There is a steady demand for electrical equipment and supplies. D. C. Durland, president of the Canadian General Electric Co., recently stated he thought it was reasonably safe to assume that the volume of business available to the electrical manufacturers in Canada during 1928 would be equal to or greater than last year.

CINCINNATI

The majority of the machine tool manufacturers in the Cincinnati district report that the market showed at least some improvement in the past week. As the head of one of the larger concerns phrased it, "the aggregate volume of sales in the week seems to have been from fair to good."

Selling agents report that while the market in local territory is showing a tendency to liven up, and while in many cases the closing point is getting nearer and nearer, the hesitancy and timidity of prospects prevented them from making any gain in the past week.

Both branches of the trade agree that while a very large amount of business is pending, the sales-resistance is so great that very often the time and effort expended in getting an order are out of proportion to the amount of money involved.

The bookings of the past week were largely confined to single tools and replacements, the principal buyers being miscellaneous users and general machinists. The orders came from practically all sections of the country, and they were well diversified as to sizes and types of tools. Many of the tools, it is stated, were bought for experimental and try-out purposes with a view to purchasing more. Concerns in the automotive field confined their purchases in the week to single tools and replacements, but there is a persistent feeling that this industry will soon order in a large way.

"The great number of well-diversified inquiries that came from all sections of the country in the past week are taken as a clear indication of need of tools," explained a manufacturer. "As the users, by constant delay, have increased the selling expense, it seems to me that they are not justified in complaining about higher prices."

INDIANAPOLIS

The last two weeks have seen a considerable improvement in the machine tool business and machinery business here. Perhaps it would be better to say the outlook is materially improved, for orders have been scattered, even though they have been more numerous. For one thing, the automobile business seems to be improving rapidly and the demand for machine tools is increasing in somewhat the same ratio. For example, all previous records of sales are being broken at the Marmon plant, here. Production also is good and promises to increase. Much the same situation prevails with the other automobile factories of the state, though not perhaps in the same proportion.

A better tone also is noted from the rail sources. While the volume of buying has not picked up to any remarkable degree, the inquiries are more numerous and the roads are preparing for their spring repair programs. Word has been received here that some shops in the state that have been closed down since before the holidays are reopening, and in other shops the payroll is being increased.

A good early demand is seen for tractors, road maintenance equipment and concrete mixers from the improved-road contractors. This business is certain to increase as the state and county officials begin letting contracts. The State Highway Commission has just let the contracts for more than 61 miles of roads to a number of different contractors.

The demand for small garage equipment also is reported to be increasing. Grinders, small lathes, chain hoists and similar equipment seems to be very much in demand. Last year was only a fair year for such equipment and the dealers are convinced that a considerable volume of purchasing will be done this spring.

Dealers in second-hand equipment report only a fair business, but a good outlook for spring and early summer. Inquiries for special brick making machinery are reported very good.

SOUTHERN DISTRICT

There has been little change in the machinery and machine tool situation in the southern district since the first of March, according to dealers and distributors in Atlanta, who state that while sales volume has not shown any appreciable gain it is still holding its own, and as a whole is equally as good as at this time last year, with some lines of equipment running considerably better than last year. The outlook is very good for the next few months.

As has been the case for some time, demand is unusually brisk for woodworking machinery in the Georgia, Florida and Carolina territory, especially in the furniture field, but active demand also is reported from the millwork, saw mill and planing mill industries, business as a whole being the best in five or six years for this type of machinery. The railroads also continue to place fairly sizeable orders for their shop needs in the heavier equipment field, mostly for various shop building projects now under way in this section. Demand is brisk for road-building machinery and contractor's equipment, and promises to continue fairly good for the next four or five months.

Textile mills are somewhat more active in the machinery market than had been anticipated earlier in the season, but are not placing orders on as large a basis as at this time in 1927, which proved an unusually large year in this field. Smaller shops and service stations are not active buyers in the new machinery or tool market, but are placing some orders for used and rebuilt equipment.

NEW YORK

After a brief setback at the beginning of the month, machine tool business has resumed its former activity, and from all indications March will be as good a month as January and February. For many companies these two months were the best in many years as they were in other parts of the country. For one dealer, at least, the past week was the best in some time. Those dealers who have not placed much actual business, and they are in the minority, are quite optimistic, as many orders are in the air that are expected to "break" in the near future.

Rumors of railroad activities have

crystallized in one order for four radial drills from a prominent road, and other business is expected to follow shortly as many old quotations were recently called in for revision due to possible price changes. One company in the city selling to all parts of the United States reports that two railroads in Georgia also placed orders in the last week for two wheel presses, an axle lathe, and a 42-in. heavy-duty engine lathe.

The Pan-American Oil Co. placed an order last week for tools for export. This list included a planer, a gap lathe, two millers, four upright drills and some punches. The Mergenthaler Linotype Co. once more stirred the market by purchasing some stub lathes. The Wright Aeronautical Co. has stopped buying temporarily, but new lists are expected in a few months when the addition to its plant at Paterson is well under way. International Motor Co. is said to have placed some orders in the past fortnight. For certain types of equipment structural shops have also furnished a fair market.

Aside from the equipment mentioned above, some universal presses, a die sinker, two automatic grinders, a 22-ft. lathe, an 1,100-lb. steam hammer, some heavy-duty grinders and a miscellaneous assortment of small machines and tools were sold in this vicinity. Sales to others centers, including Pittsburgh, Harrisburg, and California, listed such tools as six lathes ranging in capacity from 13 to 20 in., two jig borers, two vertical shapers, two radial drills, a cutting-off machine, a keyseater, a vertical punch, and some used machines.

CHICAGO

The slight decline in machine tool business as noted a week ago is said by dealers to have been overcome, the volume of trade for the last several days having taken an upward turn. While no transactions of outstanding importance have been mentioned, there has been an increase in the average number of sales booked, and the forecast is that the market will continue on a satisfactory level for some time to come.

No additional lists of railroad requirements have been reported, the Santa Fe continuing to stand as the only Western road to enter the market this year as a large buyer. A considerable increase in buying by automotive accessory plants is said to be largely responsible for present satisfactory conditions. Makers of agricultural machinery are still buying many tools, the demand for additional equipment being due to necessity for increased production.

Inquiries are being received in good volume and give promise of early closing. Dealers in used tools are experiencing a better trade than at any time since the year began. The belief is generally expressed that the total of March business if maintained at its present level will be considerably larger than that of the same month last year.

NEW ENGLAND

While the majority of machine tool builders in the New England section are reasonably well occupied, there were few outstanding orders placed during the current week. Small tools, replacements, high-production automatics, lathes and milling machinery constituted the bulk of the orders placed. Inquiries were in better volume however, and two large automobile manufactories were represented, to give promise of additional business. Dealers in second-hand and rebuilt equipment find a fairly steady demand for grinding equipment, automatic screw machines and bench tools.

The lull in business is not expected to be of lengthy duration, and optimism prevails generally. Industrial conditions were further improved during the week by favorable reports from the metal industry. A Bristol brass company has increased to full schedules, and other Connecticut companies report improvement. Business conditions in the machinery and machine tool field is at a better level than was experienced a year ago.

Engineering Foundation Re-elects Stillwell to Fourth Term

Lewis Buckley Stillwell, of New York, has been re-elected chairman of the Engineering Foundation, the research organization of the national engineering societies. Mr. Stillwell, who enters upon his fourth term, is past-president of the American Institute of Electrical Engineers and the American Institute of Consulting Engineers. He is a graduate of Lehigh, and a life trustee of Princeton. Wesleyan University has honored him with the degree of doctor of science. He is a member of the American Society of Civil Engineers, the Institution of Electrical Engineers of Great Britain; the American Engineering Council, the National Academy of Sciences, the Royal Society of Arts, Great Britain; the American Philosophical Society, and the Franklin Institute.

Arthur D. Little, president of the Arthur D. Little Laboratories, Cambridge, Mass.; and George A. Orrok, a member of the American Society of Mechanical Engineers, the American Institute of Mining and Metallurgical Engineers, and the American Society of Civil Engineers were re-elected vice-chairmen. Robert Ridgway of the American Society of Civil Engineers, and J. V. N. Dorr of the American Institute of Mining and Metallurgical Engineers were chosen additional members of the executive committee. Other officers were again named as follows: Director and secretary, Alfred D. Flinn; treasurer, Jacob S. Langthorn; assistant treasurer, Henry A. Lardner.

A gift of $10,000, to the foundation endowment, by the Central Hudson Gas and Electric Corporation has been announced. In a letter to Director Flinn, T. R. Beal, president of the corporation, said:

"You may be interested to know that this amount was earned by our employees by their more efficient operation of the physical properties under their care. It represents $10,000 of return premiums paid during the past year on accident insurance, as the result of the company's excellent record in preceding years, so that we take greater satisfaction in making this gift as it is related, to the higher standards of engineering and operating practice to which the work of the foundation pertains."

Adequate Merchant Marine Urged by Shipping Board

Competition from foreign maritime interests, which have developed their merchant fleets in the most modern fashion, is threatening to drive American vessels from the seas unless a definite program of improvement and stability is designed for our shipping and carried out, according to an exhaustive report submitted to Congress by the United States Shipping Board.

The report, a most searching analysis of our merchant shipping, sets forth specifications for the permanent establishment of an American Merchant Marine. "To serve the best interests of the people," it says, "it should be adequate in tonnage, of the most up-to-date type, second to none in speed, and readily convertible for use in national defense. American shippers would find it more advantageous to employ the services of such an American merchant marine, and it would satisfy best the nation's foreign trade and defense requirements."

The report considers in detail the factors that make it difficult for American ships to compete successfully in overseas commerce. Most of the disadvantages are found to be in the cost of construction due to higher cost of materials and higher wages and living standards here than abroad. The same wage and living standard differential applies to the cost of operation. The report points out that the government is the only agency which is able to take steps to equalize these differentials.

Furthermore, the report notes that because of the existence of American ships in large numbers since 1920, ocean freight rates have been held at lower levels and made more stable than they otherwise would have been if left entirely to foreign shipping interests to determine, and that as a result the fleet has been of assistance to farmers and manufacturers in marketing exportable surpluses and in obtaining materials for consumption at less cost. "These savings in industrial expenditures," the report states, "have aided materially in maintaining the higher wage levels in this country."

The report shows that the establishment of Shipping Board lines, where no American steamship service had previously existed, has not only stimulated American port development, but has attracted foreign competition and thus further served to build up ocean transportation facilities in the interest of the American shipper.

Weekly Engineering Index Service Now Ready

News of interest to engineers is the announcement that the "Weekly Engineering Index Service" supplied by the American Society of Mechanical Engineers now is available. This is an extension of the old Engineering Index which has been of such immense value to members of the profession for the past 44 years.

By this service valuable material in the 1,700 or more publications, received by the United Engineering Societies library, is reviewed by a staff of editors and each article is then briefly described in a carefully prepared note. These notes are classified under one of the thirteen subject headings and are printed on index cards, convenient for filing, and sent each week to subscribers.

The classification "Mechanical," is sub-divided as follows:

Automotive, agricultural, forge and foundry practice, materials handling, national defense, printing industry, refrigeration, iron and steel industry, textile and wood industries, machine building, machine design, sheet metal products, power transmission, machine tools.

Full information concerning this service together with sample index cards may be obtained by addressing Major Carlos de Zafra, director of the Engineering Index Service, 29 West 39th St., New York City.

Personals

R. L. RICKWOOD, formerly supervisor of design for the Cincinnati Bickford Tool Co., has been appointed mechanical superintendent of the new plant of the Cincinnati Inquirer.

W. G. PRASSE, of the Oilgear Co., Milwaukee, Wis., has been appointed representative in the New York district. His headquarters will be in the New York City offices of the Oilgear Co., at 342 Madison Avenue.

THOMAS BRADSHAW, general manager of Massey Harris Co., Ltd., Toronto, Ontario, has been elected president of the Canadian National Exhibition, succeeding John J. Dixon, who has held the post for the past two years.

GEORGE B. SHIRAS, formerly sales manager of the Eastern Tube & Tool Co. of Brooklyn, is now sales manager of the Specialty Trading Corporation, dealers in small tools of foreign make, located at 551 Fifth Ave., New York City.

CHARLES L. LAWRANCE, president of the Wright Aeronautical Corporation, Paterson, N. J., and designer of the "Whirlwind" motor, has been honored with the Collier Trophy, presented by President Coolidge and awarded by the National Aeronautical Association for his outstanding contribution to aviation.

P. C. BROOKS, vice-president of the Canadian Fairbanks-Morse Co., Ltd., has been elected vice-president of Fairbanks-Morse Co. Mr. Brooks, who was for a number of years in charge of the Canadian company's factory in Toronto, is also president of E. and T. Fairbanks & Co., scale manufacturers.

T. A. HYDE has been elected vice-president and A. W. TUCKER, secretary of the Henry G. Thompson & Son Co., of New Haven, Conn., manufacturer of hack saw blades. Both Mr. Hyde and Mr. Tucker have been connected with the Thompson Company for several years. Mr. Hyde has taken charge of the New York territory and Mr. Tucker has been given charge of the home office in New Haven.

Business Items

The Western Machine Tool Works, of Holland, Mich., announces the appointment of Manning, Maxwell & Moore, Inc., of Chicago, as its agent in that territory for its radial drills and tappers.

The Halcomb Steel Co., of Syracuse, N. Y., manufacturer of crucible and electric tool and alloy steels has opened new warerooms at 1297-09 Santa Fe Ave., Los Angeles, Calif., with A. A. Wescott, assistant manager, in charge.

Articles of incorporation have been issued to the Ives Engineering Co., 75 East Wacker Dr., Chicago, Ill. The company will engage in the business of drafting, drawing and designing machinery and mechanical devices. The incorporators are Clifford E. Ives, Geo. E. Mueller and F. F. Stern. Capital $50,000.

The Union Transit Co., Ltd., has been granted federal incorporation in Canada and authorized to build ships, launches, etc., and to carry on the business of shipbuilders in all its branches. The company is capitalized at $1,000,000. Headquarters will be in Toronto, Ontario.

The Ahlberg Bearing Co. of Chicago, Ill., announces the opening of a branch office at 903 Main St., Buffalo, N. Y. The branch will be in charge of H. C. Petzing, who long has been affiliated with that company as manager of the Columbus, Ohio, branch.

The Atlas Exploration Co., Ltd., has been incorporated in Canada, to carry on the business of mechanical, electrical, and hydraulic engineers and contractors of millwrights, machinists and iron and steel converters. The company has an initial capital stock of $250,000. Headquarters are in Ottawa, Ontario.

The Chase Brass & Copper Co., of Waterbury, Conn., has opened a branch office at Dallas, Texas, in the American Exchange Bank Building, it is announced by Clyde V. Wallis, manager of the industrial department of the Dallas Chamber of Commerce. C. L. Moseley of New York City will be branch manager.

The Matthew Moody and Sons Co., Ltd., manufacturer of agricultural implements in the Province of Quebec, has secured a contract with Aluminum Industries, Inc., of Cincinnati, Ohio, for the manufacture and Canadian selling rights of aluminum pistons. The castings will be sent from Cincinnati and the pistons finished in Canada.

The Canadian Pacific Railway's Western shops in Winnipeg, Manitoba, have begun expansion operations and much up-to-date woodworking machinery is being set up in the car repair department. The car repair and locomotive shops will be under way as soon as the weather permits, the work of gathering the necessary materials having already commenced. The new units together with the buildings enlarged, are to be used entirely for heavier repair work.

The United States Shipping Board has authorized Commissioner W. S. Benson, to negotiate contracts for the purchase, from the Nordberg Manufacturing Co. of Milwaukee, of twelve air-injection engines at a total cost not exceeding $426,840, as well as four engines from the Fulton Iron Works Co. of St. Louis, at a cost not greater than $107,232. The engines are for auxiliary equipment in the eight additional vessels authorized by the Shipping Board last September.

The Tridex Corporation of Dallas, Texas, specializing in the manufacture of the Tridex cleaning machine, has announced, through W. P. Gage, its president, plans for the immediate construction of a plant in Dallas, for the manufacture of the Tridex units on a quantity basis. Other officers of the Tridex Corporation are S. A. Wier, vice-president; H. E. Hobson, secretary; R. L. Thornton, treasurer; Theodore J. Fitch, director; G. L. Davidson, assistant secretary-treasurer. Mr. Wier invented the Tridex machine a few years ago and manufactured it under the firm name of the Tridex Equipment Co., Inc. The machine found a ready market with garages as an automobile cleaning apparatus.

Obituaries

C. ARTHUR SCHOESSEL, of Rock Island, Ill., general superintendent of the John Deere Harvester Works, East Moline, Ill., recently died of pneumonia.

EDWARD A. JONES, president and treasurer of the E. A. Jones & Sons Co., of Pittsfield, Mass., died recently at his home in that city.

WILLIAM E. WIGHTMAN, treasurer of the New Department Manufacturing Co., of Bristol, Conn., is dead. He was born in South Meriden, Conn., in 1868, and was at one time associated with the Russell & Erwin Co. In 1903 he joined the New Departure company and became treasurer eleven years ago.

GEORGE CROMPTON, president of the Crompton Machine Co., Lawrence, Mass., died recently at his home in that city. Mr. Crompton established the machine company in 1919. His son Kenneth G. Crompton was associated with him in the business. During the Spanish-American War he supervised the manufacture of ammunition at Lynn.

Forthcoming Meetings

American Gear Manufacturers' Association. Twelfth annual meeting, Rochester, N. Y., April 19, 20 and 21, Hotel Seneca. T. W. Owen, secretary, 3608 Euclid Ave., Cleveland, Ohio.

American Welding Society. Annual meeting, week of April 23, New York City. M. M. Kelly, secretary, 33 West 39th Street, New York City.

National Metal Trades Association. Thirtieth annual meeting, Hotel Astor, New York, April 25 and 26. J. E. Nyham, secretary, Peoples Gas Bldg., Chicago, Ill.

National Foreign Trade Council. Fifteenth anniversary convention, Houston, Texas, April 25, 26 and 27. O. K. Davis, secretary, India House, Hanover Square, New York.

American Society of Mechanical Engineers. Spring Meeting, May 14-16, Pittsburgh, Pa. Calvin W. Rice, secretary, 39 West 39th St., New York City.

Southern Supply & Machinery Dealers' Association. Will meet in annual convention in Nashville, Tenn., May 15, 16 and 17 jointly with the National Supply & Distributors' Association and the American Supply & Machinery Manufacturers' Association.

American Foundrymen's Association. Convention and Exhibit, Philadelphia, May 14 to 18. Technical Sessions at Hotel Belleview-Stratford; exhibit at Commercial Museum. R. E. Kennedy, secretary, 140 So. Dearborn St., Chicago.

National Association of Purchasing Agents. Annual meeting and "Informashow," Kansas City, Mo., May 28 to 31. W. L. Chandler, secretary, 11 Park Place, New York.

American Railway Association. Schedule of sectional meetings: Division V, Mechanical, June 13 to 20, Atlantic City, N. J.; Division VI, Purchases and Stores, June 13 to 15, Atlantic City, N. J. Division VII, Electrical, Sept. 22 to 28, Cleveland, Ohio. J. W. Welsh, secretary, 292 Madison Avenue, New York City.

Association of Iron and Steel Electrical Engineers. Annual meeting, Stevens Hotel, Chicago, June 25 to 29. J. F. Kelly, managing director, Empire Bldg., Pittsburgh, Pa.

American Society for Testing Materials. Annual meeting, Chalfonte-Haddon Hall, Atlantic City, N. J., June 25 to 29. C. L. Warwick, secretary, 1315 Spruce St., Philadelphia, Pa.

Society of Automotive Engineers. 1928 Summer Meeting, Chateau Frontenac, Quebec, Canada, June 26 to 29. C. E. Heywood, in charge of meetings, 29 West 39th St., New York.

American Railway Tool Foremen's Association. Annual meeting, Hotel Sherman, Chicago, Sept. 12, 13 and 14. G. G. Macina, secretary, 11402 Calumet Ave., Chicago.

American Railway Tool Foreman's Association. Sixteenth annual convention of the Supply Association, Hotel Sherman, Chicago, Sept. 12, 13 and 14. F. A. Armstrong, secretary, the Pratt & Whitney Co., 564 W. Monroe St., Chicago.

American Society for Steel Treating. "National Metals Exposition," Commercial Museum, Philadelphia, Pa., week of Oct. 8. W. H. Eisenman, secretary, 4600 Prospect Ave., Cleveland, Ohio.

The Weekly Price Guide

Rise and Fall of the Market

INCREASING demand for cast-iron pipe is the principal feature of an otherwise quiet iron market. Steel tank-plate demand shows improvement but without affecting prices. Washed-white wipers are up ½c. per lb. this week at New York warehouses. Aside from a rise of about ½c. in scrap lead, the nonferrous metals market shows declining trend. Copper bars, base, at New York warehouses, are off 1c. per lb. Demand is slower for cold-finished steel bars and sheets other than galvanized. Prices on both black and blue-annealed sheets dropped 10c. per 100 lb. at Pittsburgh mills, March 13, 1928.

(All prices as of March 16)

IRON AND STEEL

PIG IRON—Per gross ton, f.o.b.:

CINCINNATI	
No. 2 Southern	$21.44
Northern Basic	20.89
Southern Ohio No. 2	21.19
NEW YORK—Tidewater Delivery	
Southern No. 2 (silicon 2.25@2.75)	25.62
BIRMINGHAM	
No. 2 Foundry	16.00
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	21.76
Virginia No. 2	27.17
Basic	21.26
CHICAGO	
No. 2 Foundry local (silicon 1.75@2.25)	20.00
No. 2 Foundry, Southern (silicon 2.25@2.75)	22.80
PITTSBURGH, including freight charge ($1.76) from Valley	
No. 2 Foundry	20.26
Basic	19.26
Bessemer	21.26

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb.:

Detroit	4.50@4.75
Cleveland	5.00
Cincinnati	4.30
New York	5.25
Chicago	4.50@4.75

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the mill base in large lots.

Blue Annealed	Pittsburgh Mill Base	Chicago	Cleveland	New York
No. 10	2.10	3.50	3.25	3.89
No. 12	2.15	3.55	3.30	3.94
No. 14	2.20	3.60	3.35	3.99
No. 16	2.30	3.70	3.45	4.09
Black				
Nos. 18 to 20	2.70	3.75	3.55	4.00
No. 22	2.85	3.90	3.70	4.15
No. 24	2.90	3.95	3.75	4.20
No. 26	3.00	4.05	3.85	4.30
No. 28	3.15	4.20	4.00	4.45
Galvanized				
No. 10	3.05	4.10	3.90	4.25
Nos. 12 to 14	3.15	4.20	4.00	4.35
No. 16	3.25	4.30	4.10	4.45
No. 18	3.40	4.45	4.25	4.60
No. 20	3.55	4.60	4.45	4.75
No. 22	3.60	4.65	4.50	4.80
No. 24	3.75	4.80	4.60	4.95
No. 26	4.00	5.05	4.85	5.20
No. 28	4.25	5.30	5.10	5.45

WELDED STEEL PIPE—Warehouse discounts are as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in. steel butt welded	53%	39%	55½%	43½%	54%	41%
2½ to 6 in. steel lap welded	48%	35%	53½%	40½%	51%	38%

Malleable fittings: Classes B and C, banded, from New York stock sell at list plus 4% less 5%. Cast iron, standard, sizes 36–5% off.

Size, Inches	List Price per Foot	Diameter in Inches—External	Diameter in Inches—Internal	Thickness Inches
1	$0.17	1.315	1.049	.133
1¼	.23	1.66	1.38	.14
1½	.27½	1.9	1.61	.145
2	.37	2.375	2.067	.154
2½	.58½	2.875	2.469	.203
3	.76½	3.5	3.068	.216
3½	.92	4.0	3.548	.226
4	1.09	4.5	4.026	.237
4½	1.27	5.0	4.506	.247
5	1.48	5.563	5.047	.258
6	1.92	6.625	6.065	.28

SEAMLESS STEEL TUBING—Following net prices are for seamless mechanical tubing, cold drawn, round, .10 to .30 carbon, at New York warehouse in lots of less than 100 ft. or 100 lb.:

Thickness—Decimal	B.w.g. and Fractions	Outside Diameter in Inches—⅛	¼	⅜	½	¾	1	1¼	1½
		Price per Foot							
.035″	20	$0.15	$0.16	$0.17	$0.18	$0.19	$0.21	$0.23	
.049″	18	.17	.18	.19	.20	.21	.23	.25	
.065″	16	.19	.20	.21	.22	.23	.25	.27	
.083″	14	.20	.22	.23	.24	.25	.27	.29	
.095″	13	.21	.23	.25	.26	.27	.29	.31	
.109″	12	.22	.24	.26	.27	.28	.30	.32	
.120″ or .125″	11	.23	.25	.27	.28	.29	.31	.33	
.134″	10	.24	.26	.28	.29	.30	.32	.34	

MISCELLANEOUS—Warehouse base prices in cents per lb.:

	New York	Cleveland	Chicago
Spring steel, light*	4.50	4.65	4.65
Spring steel, heavier	4.00	4.00	4.00
Coppered Bessemer rods	6.05	6.00	6.20
Hoop steel	4.49	4.00	4.15
Cold rolled strip steel	6.25	6.00	6.10
Floor plates	5.25	5.30	5.00
Cold drawn, round or hexagon	3.40	3.65	3.60
Cold drawn, flat or square	3.90	4.15	4.10
Structural shapes	3.34	3.00	3.10
Soft steel bars	3.24	3.00	3.00
Soft steel bar shapes	3.24	3.00	3.00
Soft steel bands	3.99	3.65	3.65
Tank plates	3.34	3.00	3.10
Bar iron (2.75 at mill)	3.24	3.00	3.00
Drill rod (from list)	60%	55%	50%

Electric welding wire, New York, 5/32, 8.35c.; 1/8, 7.85c.; 5/32 to 1/2 7.35c. per lb. *Flat, 1/16@1/8-in. thick.

METALS

Warehouse Prices in Cents Per Pound for Small Lots.			
Copper, electrolytic, New York			15.37½
Tin, pigs, New York			52.25
Lead, pigs, E. St. Louis	5.85	New York	6.62½
Zinc, slabs, E. St. Louis	5.70	New York	6.62½

	New York	Cleveland	Chicago
Antimony, slabs	12.75–13.25	13.25	14.25
Copper sheets, base	22.75	22.75	22.75
Copper wire, base	19.37½	19.37½	16@16½*
Copper bars, base	21.25	22.25	22.25
Copper tubing, base	24.50	24.50	24.50
Brass sheets, high, base	18.75	18.75	18.75
Brass tubing, high, base	23.62½	23.62½	23.62½
Brass rods, high, base	16.50	16.50	16.50
Brass wire, high, base	19.25	19.50	19.25

*Mill.

Shop Materials and Supplies

METALS—Continued

	New York	Cleveland	Chicago
Aluminum ingots, 99%.....	27@28	22¾@24*	24.03*
Zinc sheets (casks).....	10@10½	12.65	10.36
Solder (½ and ½), (case lots).....	33.25	32.50	33@37
Babbitt metal, delivered, New York, cents per lb.:			
Genuine, highest grade.....			69.00
Commercial genuine, intermediate grade.....			57.00
Anti-friction metal, general service.....			31.50
No. 4 babbitt (f.o.b.).....			12.00
Nickel, f.o.b. refinery, cents per lb.:			
Ingots..... 35.00 Electrolytic.. 37.00 Shot.....			36.00

*F.o.b. producing point.

SPECIAL NICKEL AND ALLOYS—Price in cents per lb., f.o.b. Huntington, W. Va.:

Full finished nickel sheet (base).....	52.00
Cold rolled nickel sheet (base).....	60.00
Hot rolled rods, Grade "A" (base).....	45.00
Cold drawn rods, Grade "A" (base).....	53.00

Base price of Monel metal in cents per lb., f.o.b. Huntington, W. Va.:

Shot.....	28.00	Hot rolled rods (base)...	35.00
Blocks.....	28.00	Cold drawn rods (base)..	43.00
Cold rolled sheets (base)	50.00	Full finished sheets (base)	42.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Crucible copper.....	12.25 @12.50	11.50	11.00@11.50
Copper, heavy, and wire.	11.50 @12.25	10.75	10.50@11.00
Copper, light, and bottoms	10.25 @10.75	9.50	9.25@ 9.75
Heavy lead.....	4.75 @ 5.00	5.25	4.50@ 5.00
Tea lead.....	3.50 @ 3.75	3.75	3.50@ 4.00
Brass, heavy, yellow.....	7.00 @ 7.25	7.25	7.00@ 7.50
Brass, heavy, red.....	9.00 @ 9.50	9.75	9.00@ 9.25
Brass, light.....	5.50 @ 5.75	5.75	6.00@ 6.50
No. 1 yellow rod turnings.	7.50 @ 8.00	7.50	7.00@ 7.50
Zinc.....	3.00 @ 3.25	3.25	2.50@ 3.00

TIN PLATES—Charcoal—Bright—Per box.

		New York	Cleveland	Chicago
"AAA" Grade:				
IC,	14x20.....	$12.10	$11.95	$11.50
"A" Grade:				
IC,	14x20.....	9.70	9.90	9.50
	Coke Plates—Primes—Per box			
100-lb.,	14x20.....	6.10	6.10	7.00
	Terne Plates—Small lots, 8-lb. Coating—Per box			
IC,	14x20.....	7.75@8.00	7.00	7.50

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	$0.10@0.13½	$0.16	$0.15
Cotton waste, colored, per lb.	.09@ .13	.12	.12
Wiping cloths, washed white, per lb.....	.15½@.17½	38.00 per M	.15
Sal soda, per lb.....	.02	.02	.02¾
Roll sulphur, per lb.....	.027	.03½	.04
Linseed oil, raw, per 7½-lb. gal., 5 bbl. lots.....	.76½	.84	.78
Lard cutting oil, 25% lard, in 5 gal. cans, per gal....	.65	.50	.50
Machine oil, medium-bodied (55 gal. steel bbl.) per gal.....	.27	.36	.26
Belting—Present discounts from list in fair quantities (½ doz. rolls).			
Leather—List price, 24c. per lin.ft. per inch of width for single ply.			
Medium grade.....	35%	35%	35%
Heavy grade.....	30%	30%	30%
Rubber transmission, 6-in., 6 ply, $1.83 per lin.ft.			
First grade.....	45%	50–10%	50%*
Second grade.....	50%	60–5%	50–10%†

*Large quantities, 60%. †Large quantities, 60–10%.

Comparative Warehouse Prices

New York	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars.....	per lb.....	$0.0324	$0.0324	$0.0324
Cold drawn shafting....	per lb.....	.034	.033	.04
Brass rods.....	per lb.....	.165	.165	.161½
Solder (½ and ½).....	per lb.....	.3325	.3425	.425
Cotton waste, white....	per lb.....	.10@.13½	.10@.13½	.13@.17½
Emery disks, cloth, No. 1, 6-in. dia.....	per 100...	3.10	3.10	3.10
Lard cutting oil.....	per gal...	.65	.65	.55
Machine oil.....	per gal...	.27	.27	.33
Belting, leather, medium.....	off list....	35%	35%	40–5%
Machine bolts, up to 1x30 in., full kegs....	off list....	50%*	50%*	40%

*New list April 1, 1927.

MISCELLANEOUS—Continued

	New York	Cleveland	Chicago
Abrasive materials—Standard grade, in sheets 9x11 in., No. 1, per ream of 480 sheets:			
*Flint paper.....	$5.40	$4.95	$5.13
*Emery paper.....	10.71	9.15	10.71
*Emery cloth.....	27.84	27.85	27.84
Emery disks, 6 in. dia., No. 1, per 100:			
Paper.....	1.29	1.27	1.32
Cloth.....	3.10	3.05	3.05
Fire clay, per 100 lb. bag.....	1.00	.75	.75
Coke, prompt furnace, per net ton...	Connellsville,		2.65@3.00
Coke, prompt foundry, per net ton...	Connellsville,		3.75@4.50
White lead, dry or in oil...	100 lb. kegs....	New York,	13.75
Red lead, dry.....	100 lb. kegs....	New York,	13.75
Red lead, in oil.....	100 lb. kegs....	New York,	15.25

*4½ reams and under.

SHOP SUPPLIES

Discounts from new list dated Apr. 1, 1927, applying on immediate deliveries from warehouse stocks in New York and vicinity:

	Full Kegs or Cases
Machine bolts, square heads and nuts:	
Up to ¾ x 6-in.....	55%
Larger up to 1 x 30-in.....	50%
1¼ and 1½ in. dia.....	35%
Carriage bolts:	
Up to ½ x 6-in.....	55%
Larger sizes.....	50%
Coach and lag screws:	
Up to ½ x 6-in.....	55%
Larger sizes.....	50%
Tap bolts, hexagonal heads.....	40%
Nuts:	
Hot pressed, square and hexagonal, blank or tapped, up to 1-in., incl.....	55%
Cold punched, square and hexagonal, blank or tapped, up to 1-in. incl.....	55%
Semi-finished, hexagonal, tapped, in packages, all sizes.....	40%
Case hardened, hexagonal, tapped, in packages, all sizes.....	30%
Washers: Deduct from list, per 100 lb.....	$3.50*
Rivets, button and cone head:	
Small, including ⅛-in. dia.....	50–10%
Large (base) per 100 lb. net.....	$5.00†

Note—For less than case or keg quantities on bolts, screws, hot-pressed and cold-punched nuts, add extra of 10 per cent to list.
*Broken keg lots, $1.50 off list. †Broken keg lots, $6.50 net.

Machine Requirements and Industrial Construction

Equipment Wanted

La., New Orleans—Orleans Parish School Board, City Hall Annex—taking bids for tools, machinery, etc.

Mass., Medford—M. Judd & Son, Fellsway cor. 2nd St.—sawmill, Lane or Chase, 26 to 30 ft. carriage.

Mich., Detroit—Huron Forge & Machine Co., 9041 Alpine Ave.—machine shop equipment including press.

Minn., Minneapolis — Bd. of Education, 305 City Hall—will receive bids until Mar. 29, for woodworking machines for Patrick Henry school, also until Mar. 30, for metal working equipment for school.

N. J., East Orange — Eclipse Machine Co.—high speed gear shaper, No 7.

N. Y., Long Island City — Borough of Queens, M. E. Connolly, Pres., 68 Hunterspoint Ave.—will receive bids until Mar. 26, for four 6 ton full revolving portable cranes mounted on 5 ton chassis for Bureau of Street Cleaning.

Okla., Oklahoma City—Oklahoma City Brass Pipe Co.—machinery and equipment for proposed 1 story foundry on Seventh St. Estimated cost $50,000.

Pa., Philadelphia—Dept. of City Transit, 11th floor, 1211 Chestnut St., C. E. Meyers, Dir., will receive bids until Mar. 27 for machinery and equipment for shop buildings for Fern Rock Terminal yard, Broad Street subway Cont. 176. Sections A to Z. —car wheel lathe—car wheel boring machine—combination journal and axle lathe —one each 13.5 in. swing tool room lathe, 16, 18 and 20 in. and two 24 in. swing engine lathes—3.25 x 12 in. turret lathe—universal milling machine—24 in. crank shaper—five 14 in., two 20 in. drill presses, one 5 ft. radial drill—30 ton vertical broaching, 200 ton axle-straightening, 300 ton horizontal, and 600 ton wheel presses—drill grinder, universal tool grinder, eight 14 x 2.5 in. two wheel grinders, one 8 x 3 in. two-wheel grinder, axle grinder—2 in. single-head bolt threading and 2 in. pipe threading and cutting machines—valve finishing machine—oil-stone tool grinder, 16 in. jointer, trimming knife, 24 in. patternmakers lathe, 36 in. band, 16 in. circular cut-off and shaftless variety saws—¾ in. gap punch, one bending brake, 8 ft. forming roll, 8 ft. squaring shear—three blacksmith anvils, one blacksmith bender, combined punch, shear and angle cutter, 6 in. power hack saw, 800 lb. single frame air hammer, power mechanical sledge, forge equipment (with 3 forges, 2 blower fans, 1 exhaust fan and appurtenances)—air compressor and receiver—electric welding outfit—armature extractor, universal armature machine, bar bender, 8 bench furnaces on electric brake oven, four 500 lb. Babbitt and one 500 lb. tin melting pots, pinion puller, reel rack, insulation shear, wire-skinning machine, commutator slotter, coil spreader, 6 armature stands, two coil-taping machines, one kicker vise, coil winder, cleaning cabinet—1 ton Monorail hoist for air brake shop, one 2 ton Monorail hoist for wheel lathe—12 skid platforms, one each 3,400 lb. elevating hand, 4,000 lb. storage battery lift, 3,000 lb. storage battery crane type, 2,000 lb. storage battery lift (width 28 in.) trucks—6 industrial trucks, 5 section industrial track, 3 track turntables—two 35 ton journal jacks, one 300 lb. counter and 2,500 lb. portable warehouse scales, blacksmith, 46 machinists and 3 pipe vises, etc.

Pa., Pottstown — D. K. Bullens Co. — Niagara Press, No. 57.

Tenn., Knoxville—City—electric traveling crane for proposed 50 x 300 ft. garage and repair shop.

Ont., Galt—Canadian Edge Tool Co., 115 Wellington St.—machinery and equipment for factory to replace fire loss.

Ont., Walkerton—R. E. Truax & Son—woodworking equipment for the manufacture of kitchen cabinets, built in cupboards and similar lines for proposed 2 story, 80 x 100 ft. factory. Estimated cost $50,000.

Que., Montreal—Canadian Pacific Ry. Co., E. N. Bender, Gen. Purch. Agt.—additional equipment for mechanical and car department; old equipment at Glen Yards. Outremont and Hochelaga to be replaced with modern equipment.

N. S. W., Sidney—E Garfield Andrews, 79 Queen St., Ashfield, engineer and importer—inquiry for catalogs and helpful information with prices where possible, covering quarry machinery, gag saws, carborundum machines, planing machines, rubbing beds, floats, polishing machines and all special machinery for stone, marble or granite. Mr. Andrews also states that a concern in which he is interested will install a complete plant for the manufacture of cylinder type pneumatic hoists. Standard Bank of So. Africa, 67 Wall St., N. Y. reference.

Opportunities for Future Business

Ark., Texarkana — City voted $35,000 bonds for development of a municipal air field including the construction of shops, hangars, etc.

Colorado — Denver Rio Grande Western R.R. Co., Denver, plans the construction of a foundry and shops at Salida, Colo., etc. $100,000. A. O. Ridgway, Ch. Engr.

Conn., Danbury—New England Transportation Co., is having preliminary plans prepared for the construction of a garage and work shop on Osborn St. Estimated cost $40,000. W. T. Dorrance, Avon St., New Haven, Archt. Noted Jan. 12.

Conn., Thomaston — Seth Thomas Clock Co., Elm St., awarded contract for a 4 story, 60 x 100 ft. factory. Noted Mar. 8.

Ill., Chicago—C. J. Vopicka, 431 North Michigan Ave., is having plans prepared for a 5 story, 80 x 140 ft. garage at State and 11th Sts. Estimated cost $600,000. Fox & Fox, 38 South Dearborn St., Archts.

Mass., Framingham—Owner, c/o Rosenblatt Bros., Mallaney Bldg., Archt., is having sketches made for a 1 story, 110 x 135 ft. repair shop and service station. Estimated cost $60,000.

Mass., Lynn—Green Garage Inc., Lewis St., plans a 1 and 2 story addition to repair and service garage. Estimated cost $40,000. E. Earp, 333 Union St., Archt.

Mass., Milton—Warshaws Inc., 4 Projects Rd., awarded contract for a 2 story, 45 x 90 ft. addition to shop.

Mass., North Attleboro—W. G. Clark & Son, Chestnut St., manufacturers of jewelry, awarded contract for a 2 story addition to factory.

Mass., South Boston (Boston P. O.)—New England Metal Culvert Co., Tennyville St., Palmer, awarded contract for a 1 story factory, here.

Mass., Waltham (Boston P. O.)—Stark Tool Co. Inc., C. E. Potter, Pres., 416 Moody St., plans a 2 story addition to factory. Estimated cost $40,000. Private plans.

Mass., Watertown (Boston P. O.)—Peerless Pressed Metal Co., 14 Electric Ave., Brighton, is receiving bids for a 1 story, 80 x 200 ft. factory, here. Estimated cost $40,000. Private plans. Noted Mar. 15.

Mass., Webster—Waterhouse Co., Tracy Court, is receiving bids for the construction of a 2 story, 70 x 95 ft. auto body factory. L. J. Chaffe, Oxford, Archt.

Mo., Jefferson Barracks (Br. St. Louis)—U. S. Veterans Bureau, Washington, D. C., will soon award contract for the construction of a new shop building here.

Mo., St. Louis—Carter Carburetor Co., 2838 North Spring Ave., awarded contract for a 2 story, 90 x 250 ft. addition to factory. Estimated cost $65,000.

N. J., Maplewood—Bd. of Education of School District of South Orange and Maplewood, County of Essex, will soon award contract for the construction of a maintenance building including 52 x 93 ft. office and shop, garage, etc.

N. J., Newark—A. Peter, 207 Market St., Archt., is receiving bids for a 1 story, 52 x 125 and 13 x 40 ft. factory at Ave. L. and Mary St. for Hygienic Tube Co., 88 McWhorter St. Estimated cost $45,000.

N. J., Newark—V. & R. Tedeschi, 25 Mercer St., will build a 2 story, 66 x 100 ft. machine shop at 305-309 Morris Ave. Estimated cost $50,000. J. B. Accocella, 9 Clinton St., Archt. Noted Jan. 26.

N. J., Paterson—Cowego Realty Co., L. Gottlieb, Pres., East 27th St., is receiving bids for a 2 story, 215 x 250 ft. garage on Ellison Pl. Estimated cost $250,000. A. E. Sleight, Romaine Bldg., Archt.

O., Canton—Timken Roller Bearing Co., Dueber Ave. S.W., awarded contract for four units to factory, 100 x 285, 100 x 365, 80 x 135 and 135 x 252 ft. Estimated cost $200,000.

O., Cleveland—Acre Auto Radiator Co., J. T. Bares, Mgr., 7707 Carnegie Ave., is having plans prepared for a 2 story, 36 x 175 ft. factory at 7120 Carnegie Ave. Estimated cost $60,000. Private plans.

O., Cleveland—Scott & Fetzer Co., G. H. Scott, Pres., 11401 Locust Ave., manufacturers of vacuum cleaners, had plans prepared for a 2 story, 40 x 60 ft. addition to factory. Estimated cost $40,000. A. C. Wolf, Swetland Bldg., Archt.

O., Cleveland—Gustave Schaefer Wagon Co., H. Schaefer, Mgr., 4180 Lorain Ave., awarded contract for rebuilding 4 story factory recently destroyed by fire. Estimated cost $150,000.

Pa., Butler—Columbia Steel Co., Division American Rolling Mills Co., Middletown, O., had preliminary plans prepared for addition to steel mill including shipping building, cold mill building, box enamel building, etc. here. Estimated cost $2,000,000. D. P. Robinson Co. Inc., 125 East 46th St., New York, N. Y., Engr.

Pa., Memacolin—Youngstown Sheet & Tube Co., Stambaugh Bldg., Youngstown, O., is having preliminary plans prepared for the construction of a coal washing plant including two 6000 ton coal storage bins, etc. here. Estimated cost $1,000,000.

Pa., Philadelphia—H. Ditkow, H. Montague, J. Cohen and A. Wochs, c/o Silverman & Levy, 313 South Smedley St., Archts., awarded contract for a 4 story, 93 x 108 and 18 x 65 ft. garage at 18th and Ludlow Sts. Estimated cost $200,000. Noted Feb. 16.

Pa., Pittsburgh—Mine Safety Appliance Co., Braddock and Thomas Aves. is having plans prepared for a 3 story addition to factory on Braddock Ave. Estimated cost $200,000. B. H. Prack, Martin Bldg., Archt.

Tenn., Knoxville—City will receive bids about Mar. 20, for a 1 story, 50 x 300 ft. garage and repair shop on East 5th Ave. Estimated cost $100,000. L. M. Dow, Brownlow Bldg., Archt.

Tex., Arlington — Southern Ornamental Iron Works, 2425 South Harwood St., awarded contract for a 1 and 2 story, 100 x 317 ft. plant. Estimated cost $60,000. Noted Dec. 22.

B. C., Vancouver—Bd. of School Trustees, will receive bids until Mar. 26, for a 3 story technical school including 133 x 283 ft. work shop, etc. at Broadway E. and Clinton St. Estimated cost $500,000. W. H. Postle, 590 Hamilton St., Archt. P. P. Brown, 407 London Bldg., Engr.

N. B., St. John—Murray & Gregory Ltd., Marble Cove, will soon receive bids for the construction of a woodworking plant. Estimated cost $45,000.

Ont., Oshawa—General Motors of Canada, awarded contract for a 1 story, 25 x 75 ft. garage. Estimated cost $150,000.